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ARMY CONCEPT TEAM IN VIETNAM
APO SAN FRANCISCO 96243

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ARMY CONCEPT TEAM IN VIETNAM
AFO San Francisco 96243

EMPLOYMENT OF THE HELICOPTER M-5 40mm GRENADE LAUNCHER (U)

JOINT RESEARCH AND TEST ACTIVITY
Office of the Director
APO San Francisco 96309

REPORT OF EVALUATION BY DIRECTOR JRATA

The report is an excellent documentation of the time, equipment, and manpower necessary to operate the M-5 40mm Grenade Launcher armament subsystem in normal daily helicopter combat operations in RVN. The system was used effectively to support 40 combat operations under varying tactical situations. The report contains the most extensive set of damage assesment data collected during a JRATA weapons evaluation. The conclusions and recommendations of the report are substantiated and I concur in them. I recommend that command action be taken to implement the recommendations of the report which will directly contribute to increasing the effectiveness of airmobile operations in Vietnam.

Approved:

25 January 1966

JOHN K. BOLES, JR.
Brigadier General, USA
Director

CONFIDENTIAL

ARMY CONCEPT TEAM IN VIETNAM
APO San Francisco 96243

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(6) EMPLOYMENT OF THE HELICOPTER M-5 40mm GRENADE LAUNCHER (U). (8)

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(10) Bob Walters and Richard Thomas.

Approved:

Hugh E. Quigley

HUGH E. QUIGLEY
Colonel, Armor
Chief

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I. (C) PREFACE

A. ABSTRACT

The purpose of this evaluation was to determine the operational suitability and concepts for employing the M-5 40mm Grenade Launcher mounted on UH-1B helicopters in the counterinsurgency environment of the Republic of Vietnam (RVN).

The M-5 armament subsystem, consisting of the M-75 grenade launcher in a flexible, power-operated, copilot/gunner controlled turret, was designed to provide helicopters with an improved fire capability. The first six subsystems arrived in the Republic of Vietnam (RVN) on 16 May 1965 and the evaluation was conducted from July through September 1965 to ascertain the effectiveness of the system against insurgent targets, to document the technique of employment, and to establish the proper mix of this subsystem with other weapon subsystems employed by UH-1B helicopter companies. The M-5 was fired by ACTIV evaluators and its performance documented on 40 combat operations under varying terrain, weather, and operational conditions. Statistical data were recorded after each mission with supplementary data gathered by interview and discussion with key personnel at all levels.

The M-5 subsystem provides the aviation commander a weapon which partially fills the gap between the 7.62mm machinegun and the 2.75-inch folding fin aerial rocket (FFAR). It was most effective against personnel in the open but it was also effective against sampans, thatched huts, ammunition storage areas, and weapon positions without overhead cover. It provided suppressive fires up to 1200 meters when employed in areas other than dense jungle. In addition, it was capable of neutralization and destructive fires against soft targets within 700 meters. The M-5 was not effective when immediate reaction was required (escort missions) because of the time delay created by the low muzzle velocity of the projectile. Because of sighting limitations, close-in fires could not be provided safely at ranges over 700 meters unless firing passes were parallel to the front line of friendly ground forces.

The M-5 subsystem, although evaluated only on armed UH-1B's, is considered a suitable weapon for troop transport helicopters. United States Army, Vietnam (USARV) has recommended the development of a modification kit to permit installation on the UH-1D. The present authorization of two M-5 subsystems per airmobile company should be increased to six, three mounted on UH-1B helicopters of the armed platoon, one each on a UH-1D of the two transport platoons, and one held as a backup.

B. OBJECTIVES AND METHODS

1. Objective 1 - Employment Techniques

Document the technique for employing the M-5 armament subsystem in a counterinsurgency environment.

To meet this objective, evaluators were copilot/gunners in helicopters equipped with the M-5 armament subsystem during combat operations. Data were recorded by evaluators after each mission.

2. Objective 2 - Operational Capabilities, Limitations, and Combat Effectiveness

Evaluate the operational capabilities, limitations, and combat effectiveness of the M-5 armament subsystem in support of the counterinsurgency effort in Vietnam.

To meet this objective, evaluators again were copilot/gunners in M-5 helicopters. Aviation commanders, pilots of armed/unarmed helicopters, and crew chiefs were debriefed following each mission. Additionally, a sampling of comments was taken from US advisors and ARVN ground commanders.

3. Objective 3 - Equipment and Personnel Requirements

Determine the number of subsystems required and the adequacy of the TOE of aviation units so equipped with the M-5 armament subsystem.

This objective was met by examining unit records and documents and interviewing aviation commanders. Evaluators also observed and recorded procedures in subsystem operation, maintenance, use of special equipment, and ammunition handling.

4. Objective 4 - Logistical Support

Determine the logistical support required for the M-5 armament subsystem in a counterinsurgency environment.

To meet this objective, evaluators observed and documented malfunctions of the subsystem and ammunition, repair parts usage, and ammunition expenditure.

C. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

The M-5 armament subsystem, in areas other than dense jungle, is suitable for employment in the counterinsurgency environment and is capable of delivering volume, non-nuclear, area fires in support of airmobile and ground elements. When mounted on an armed helicopter, the M-5 subsystem, because of its short range, needs to be combined with another aircraft

weapon system possessing greater range capabilities. The subsystem, with its traverse capability and accuracy at short ranges could provide close-in protection for troop transport helicopters entering and leaving the landing zone. Additional M-5 subsystems could be well-employed in the airmobile company. Training requirements would be reduced and subsystem accuracy would be improved by the correction of shortcomings, especially sight limitations and lack of a tracer/marking round.

Each airmobile company in RVN should be authorized six M-5 armament subsystems, three in the armed platoon, one each in the two troop transport platoons, and one backup subsystem. An M-5 copilot/gunner training course with special emphasis upon range estimation should be established and conducted by US Army, Vietnam. Aircraft armament personnel and ammunition handlers should be organic to the airmobile company and an aircraft armament field maintenance detachment should be located within the aviation battalion area.

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II. (U) INTRODUCTION

A. PURPOSE

The purpose of this evaluation was to determine the operational suitability and the concepts for employing the M-5 40mm grenade launcher mounted on UH-1B helicopters in the counterinsurgency environment of the Republic of Vietnam (RVN).

B. BACKGROUND

The M-5 armament subsystem was designed to provide helicopters with an improved groundfire suppressive capability through the use of the M-75 grenade launcher in a flexible power-operated copilot/gunner controlled turret.

After development of the M-5 armament subsystem by Springfield Armory, engineering tests were conducted from April to July 1963 at Aberdeen Proving Ground (APG), Maryland. Upon completion of engineer testing, service testing was conducted at Fort Rucker, Alabama and Fort Benning, Georgia, from 15 July to 20 November 1963. At the conclusion of this phase of testing, an interim report recommending type classification was submitted by the US Army Aviation Test Board (USAAVNTBD). Following the service test, engineering tests were resumed at APG and, as a result of these tests, the subsystem was returned to the developer for major modifications. Upon release by the developer, a final engineering test was conducted at APG with the USAAVNTBD monitoring the test and, in June 1964, the subsystem was type classified standard A.

In July 1964, The Military Assistance Command, Vietnam (MACV) requested that the United States Army Support Command, Vietnam, now US Army, Vietnam (USARV), be furnished 18 M-5 armament subsystems for evaluation in the antipersonnel and groundfire suppressive roles. The allocation to Vietnam was later changed from the original 18 to 38 subsystems. Authorization of subsystems was two per airmobile company. The first six subsystems, one of which had been previously installed on a UH-1B in CONUS, arrived in RVN on 16 May 1965. The CONUS-installed subsystem was test fired on 21 May 1965 and was used for copilot/gunner training. The first modification work order for a B kit (aircraft), necessary to attach the subsystem to the helicopter, was started on 16 May 1965 and completed on 22 May 1965. A C kit (weapon) installation, check-out, and test firing was completed on 29 May 1965. The first M-5 combat mission in RVN was conducted 30 May 1965.

C. DESCRIPTION OF MATERIEL

1. M-5 Armament Subsystem

The M-5 armament subsystem is an area fire weapon specifically designed for helicopters and used in combination with the XM-3 armament subsystem on the UH-1B in the RVN. (See figure 1.) It consists of: The M-75 grenade launcher (gun) in a nose-mounted flexible turret containing elevation and azimuth drives, and a sighting station, a servo amplifier and junction box, turret control panel, ammunition booster, ammunition chute, and ammunition box. The M-75 grenade launcher is an air-cooled, electric-motor driven, reciprocating-barrel, 40mm, rapid-fire weapon capable of launching fragmentation-type projectiles. The ammunition is metallic linked, belt-fed from above, and percussion fired. The spent cases and links are ejected downward. The turret may be elevated 15 degrees, depressed 35 degrees, and traversed 60 degrees to the left and right of the aircraft center line (120 degrees total traverse). The copilot/gunner aims and fires the gun through the use of a combination sight and hand control (sighting station). Within the physical travel limitations of the turret, gun control is independent of the helicopter flight attitude. The gun may be stowed in a pre-set fixed position and fired from the cyclic control stick by either the pilot or copilot. The subsystem weighs 335.3 pounds when fully loaded with one belt containing 75 rounds in the ammunition chute and 75 rounds in the ammunition box (located in the cargo/passenger compartment). The average cyclic rate of the weapon is 225 to 230 shots per minute.

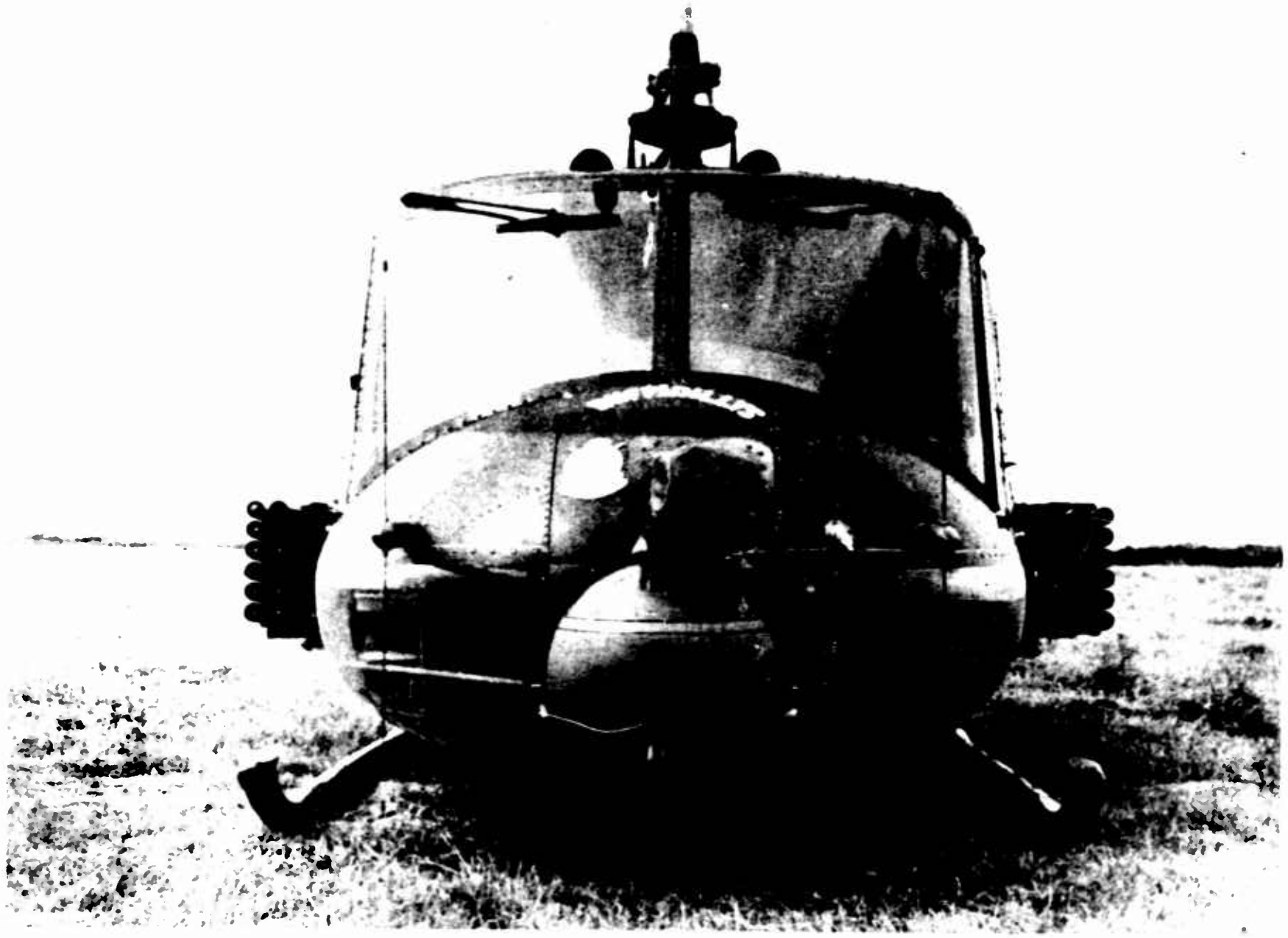
2. Cartridge, 40mm, HE, M-384 with Fuze, M-533

The cartridge, M-384, with fuze, M-533, employed with the subsystem is an anti-personnel, fixed ammunition-type cartridge. (The cartridge is not compatible with the M-79 40mm grenade launcher.) The projectile ogive and the cartridge case are aluminum and the projectile body is steel. The overall length of the complete round is 4.415 inches. The projectile attains a muzzle velocity of 790 feet per second and spins at approximately 11,800 revolutions per minute. The M-533 fuze used with the M-384 cartridge is a point-detonating type with a mechanical escapement arming delay which provides a minimum arming distance of 60 feet from the launcher muzzle. The fuze functions on graze or impact. Detonation will occur at angles of impact from 90 degrees to 5 degrees.

D. SCOPE

1. Definition of the Project

The M-5 armament subsystem was evaluated to determine its effectiveness against insurgent targets and the proper mix of the system along with other weapon systems employed in UH-1B helicopter companies in a counterinsurgency role.



(U) FIGURE 1. M-5/XM-3 armament subsystem.

2. Setting of the Project

a. Environment

The evaluation was conducted in the II and IV Corps areas of the Army of the Republic of Vietnam (ARVN). These areas contain representative terrain features of South Vietnam. See annex B for a detailed description.

b. Military Elements

The evaluation was conducted during combat operations that employed elements of the 13th and 52d Aviation Battalions.

3. Explanation of Terms

The terms listed below are peculiar to this report and are not listed in Army Regulation 320-5.

a. Airmobile Assault - The airlifting of troops from a staging area to a preplanned landing zone. The armed helicopter will normally be responsible for the reconnaissance, pre-strike, marking, and escort of troop-carrying elements into and from the LZ, and protection while in the LZ.

b. Break - The abrupt change in direction of flight of an armed helicopter during target disengagement to avoid overflying the target. May be right or left.

c. Daisy Chain Formation - A formation employed on both sides of the landing zone with fire teams executing an elliptical orbit, oriented to the direction of landing, at an absolute altitude of 10 to 500 feet. The purpose is to detect and report enemy movement and suppress enemy fire while the troop transports are on final approach, on the ground and during departure from the LZ.

d. Eagle Assault - A rapid response airmobile operation on a smaller scale (generally platoon or company size) into an unplanned landing zone. The landing is generally followed by heliborne extraction later in the day.

e. Extraction - The removal by air of troops from a specific area.

f. FFAR - Folding fin aerial rocket.

g. Firing Pass - A planned armed helicopter attack on an enemy position or suspected enemy position with the purpose of neutralization or destruction.

h. Helicopter Prestrike - The placing of fire in and around the landing zone prior to the landing of troop transport helicopters. Its purpose is to neutralize the area, thus allowing unarmed elements to land free of enemy fire.

i. M-6/2.75-inch FFAR Armament Subsystem - Armament subsystem, developed in RVN, which combines rocket launchers and machineguns and is similar to the production XM-16 armament subsystem. The M-6 subsystem possesses primarily a suppressive fire capability and mounts four flexible 7.62mm M-60 machineguns. The 2.75-inch rockets provide a neutralization capability with two pods containing 6 to 7 rockets each (12 to 14 total).

j. Light Fire Team - The light fire team is the basic element of the armed platoon and is normally commanded by a first lieutenant. It is the smallest armed helicopter unit to be employed tactically and consists of two UH-1B helicopters armed with the M-6/2.75-inch FFAR subsystem.

k. Heavy Fire Team - The heavy fire team is employed on missions where the tactical situation dictates a need for greater fire power. It consists of one light fire team reinforced by one UH-1B normally flown by the platoon commander and armed with the XM-3 armament subsystem or the combination XM-3/M-5 armament system. The XM-3 subsystem possesses a neutralization capability and has forty-eight 2.75-inch FFAR's. The XM-3/M-5 armament subsystem consists of the complete M-5 subsystem and a modified XM-3 system with twenty-four to thirty-six 2.75-inch FFAR's.

l. Armed Platoon - The platoon is employed to accomplish those missions associated with an airmobile assault or required by the tactical situation. The platoon is authorized nine UH-1B helicopters consisting of six UH-1B's with the M-6/2.75-inch FFAR armament subsystem and three UH-1B's with the XM-3 armament subsystem. In addition, upon arrival in RVN of the M-5 armament subsystem, each airmobile company has been authorized two M-5 40mm grenade launchers and has been directed by US Army, Vietnam either to mount the grenade launcher as a single installation on the UH-1B or to combine it with the XM-3 armament subsystem. In most cases, the grenade launcher has been installed with the XM-3, which necessitates removal of one or two banks of pods per side (12 to 24 rockets) to remain within the gross weight limitation of the UH-1B.

E. EVALUATION DESIGN

1. Methodology

a. Data Collection Methods

Army Concept Team in Vietnam (ACTIV) evaluators participated in 40 combat operations employing the M-5 armament system. Discussions were held with armed platoon commanders, aviation company commanders, pilots of both armed and troop transport helicopters, crew chiefs, and

other participating personnel concerning all aspects of the M-5 and its operation. A checklist was completed by evaluators after each mission. (See annex E.)

b. Analysis Methods

The analysis method was essentially a study of results obtained from the evaluator checklists completed on each combat operation in which the M-5 was used. Commanders' opinions and project officers' records were reviewed in detail to determine the combat effectiveness and limitations of the M-5 armament subsystem.

2. Limitations and Variables

The command and control of the UH-1B XM-3/M-5 helicopter and other armed elements rested entirely with the aviation commanders and could not be controlled by ACTIV evaluators. The evaluation was made during combat operations and no controlled testing could be undertaken. No operation was conducted for the sole purpose of testing the M-5 subsystem. As a rule, detailed assessment of casualties and weapon effects data could not be obtained by ground inspection because of the insurgent practice of evacuating their dead and wounded, and the frequent inability of friendly forces to occupy target areas immediately after an engagement.

Initially, it was planned to operate with one specific airmobile company in each of the two battalions (13th and 52d). As the evaluation progressed, however, evaluators were moved among the airmobile companies within each battalion because poor weather conditions often resulted in mission cancellation of a particular unit. This practice resulted in the expenditure of considerable time, since evaluators had to prove themselves combat qualified to each new armed platoon commander before being allowed to function with the unit.

In August 1965, large scale operations were being conducted in the II Corps area (Highlands) with little VC contact. Consequently, only a limited amount of data were collected, especially data on weapon effects. Because of this, the evaluator in the II Corps area was transferred on 18 August 1965 to the IV Corps area (delta) where smaller scale operations with numerous VC contacts were being conducted.

3. Support Requirements

The ACTIV project officer and two TDY officer personnel from CONUS acted as evaluators. One TDY typist from CONUS provided administrative assistance. Training and gunner qualification in the M-5 subsystem for the TDY evaluators was provided by US Army, Vietnam and the US Army Materiel Command 40mm Introductory Team. Funds to support TDY personnel were provided by the US Army Combat Developments Command.

4. Time Schedule

The evaluation plan submitted to CINCPAC on 8 May 1965 stated the evaluation was scheduled for 1 August 1965 with data collection for 90 days. On 21 May 1965, because of the exceptional interest expressed by airmobile companies within RVN, ACTIV recommended change of the starting date from 1 August to 1 July 1965 and a reduction in the data collection period from 90 to 60 days.

On 2 June 1965, CINCPAC approved the initial evaluation plan. Department of the Army, on 15 June 1965, approved the evaluation plan changes and estimated that the TDY evaluators would arrive in the RVN on or about 28 June 1965.

Two officer TDY evaluators arrived on 9 July 1965. Briefings, M-5 ground school, gunner training, and qualification were conducted from 10 to 14 July 1965. One evaluator was attached to an airmobile company on 15 July 1965. Tactical flight and additional copilot/gunner training for this evaluator was conducted from 16 to 18 July 1965. The second evaluator was attached to an airmobile company on 17 July 1965 with tactical flight and additional copilot/gunner training conducted on 18 July 1965. Data collection commenced on 19 July 1965 and terminated on 16 September 1965.

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III. (C) DISCUSSION

All reference herein to altitude and speed is made to absolute altitudes and indicated airspeeds.

A. (U) OBJECTIVE 1 - EMPLOYMENT TECHNIQUES

Inasmuch as the M-5 subsystem was rarely employed separately, the techniques discussed in objective 1 include not only the M-5 subsystem but also associated weapon systems of the light fire team, heavy fire team, and the armed platoon.

Techniques of armed platoon employment in RVN varied among airmobile companies and ARVN corps areas. To describe in detail all the techniques observed in each of the seven armed platoons evaluated would unnecessarily expand this report and, therefore, techniques discussed are those generally employed in the II Corps (highlands) and IV Corps (delta).

1. Visual Reconnaissance

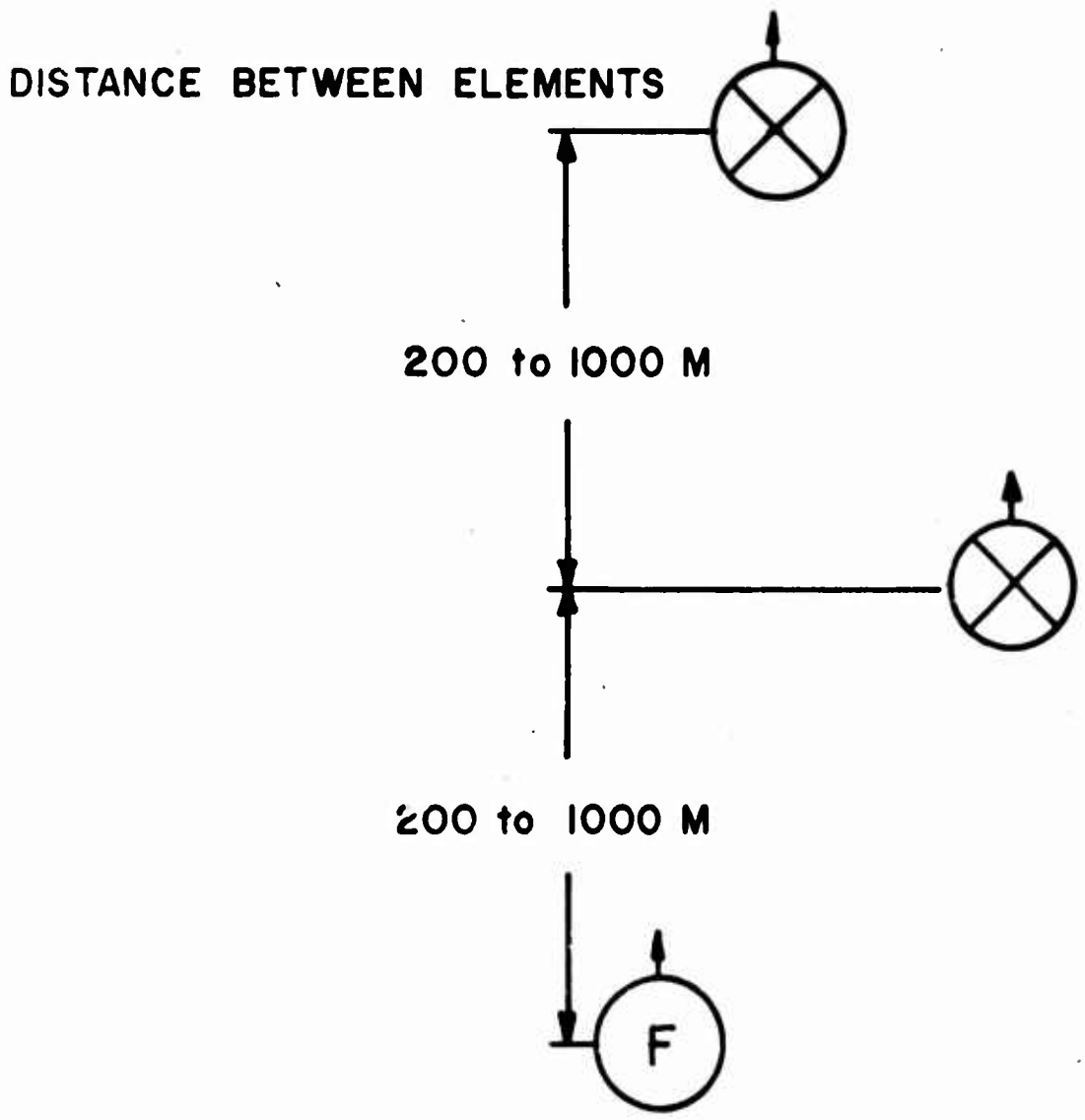
Visual reconnaissance was normally conducted by a light fire team consisting of two helicopters armed with the M-6/2.75-inch FFAR system. When visual reconnaissance was conducted by a heavy fire team, the XM-3/M-5 helicopter was used in the trail position. (See figure 2.)

2. Support of Airmobile Assault

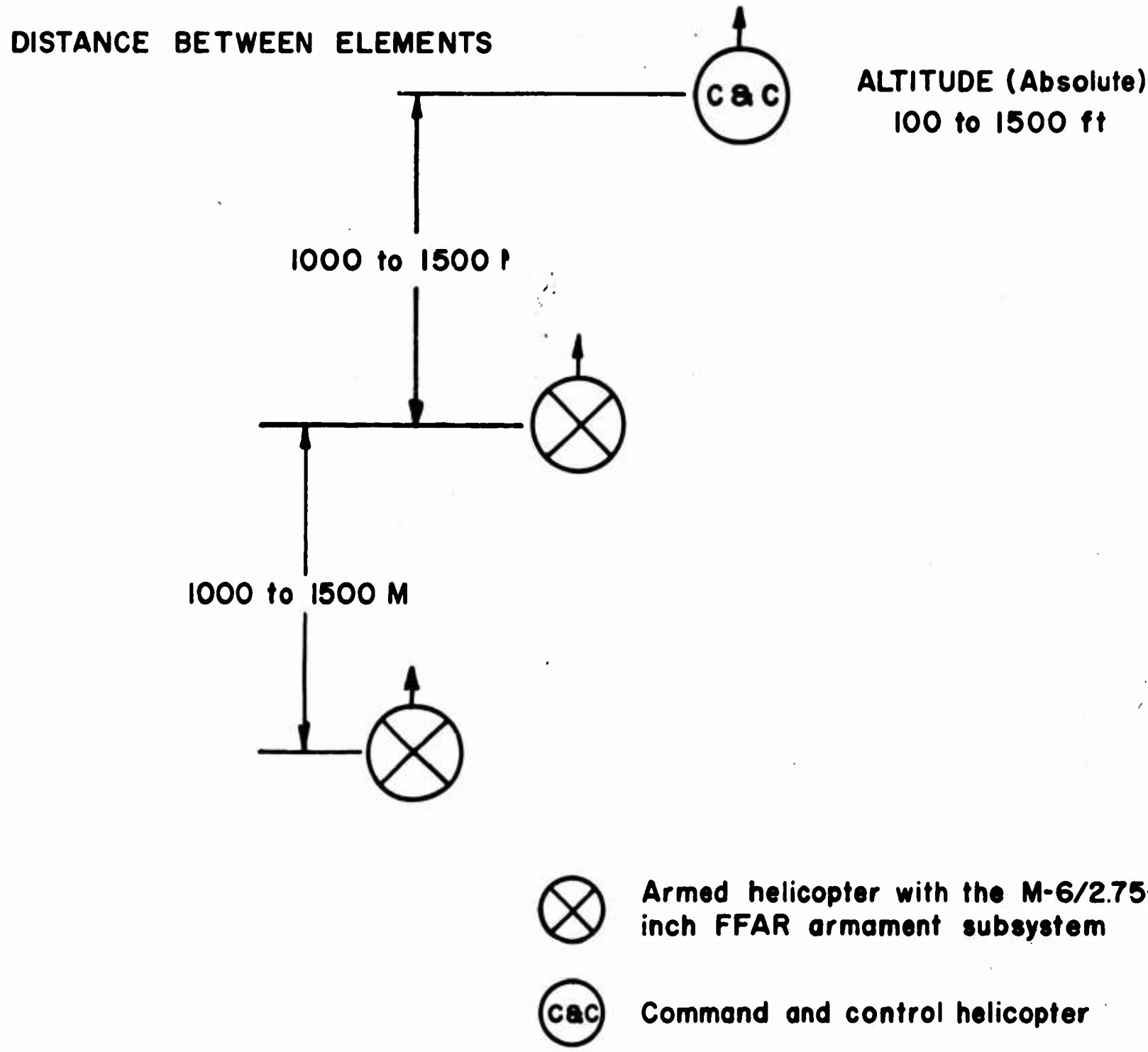
a. Reconnaissance of Landing Zones

Reconnaissance in the II Corps area was generally conducted 1 to 3 days prior to the assault, as the shortage of landing zones (LZ's) precluded rapid selection. Normally, reconnaissance was performed by a command and control helicopter escorted by a light fire team. (See figure 3.)

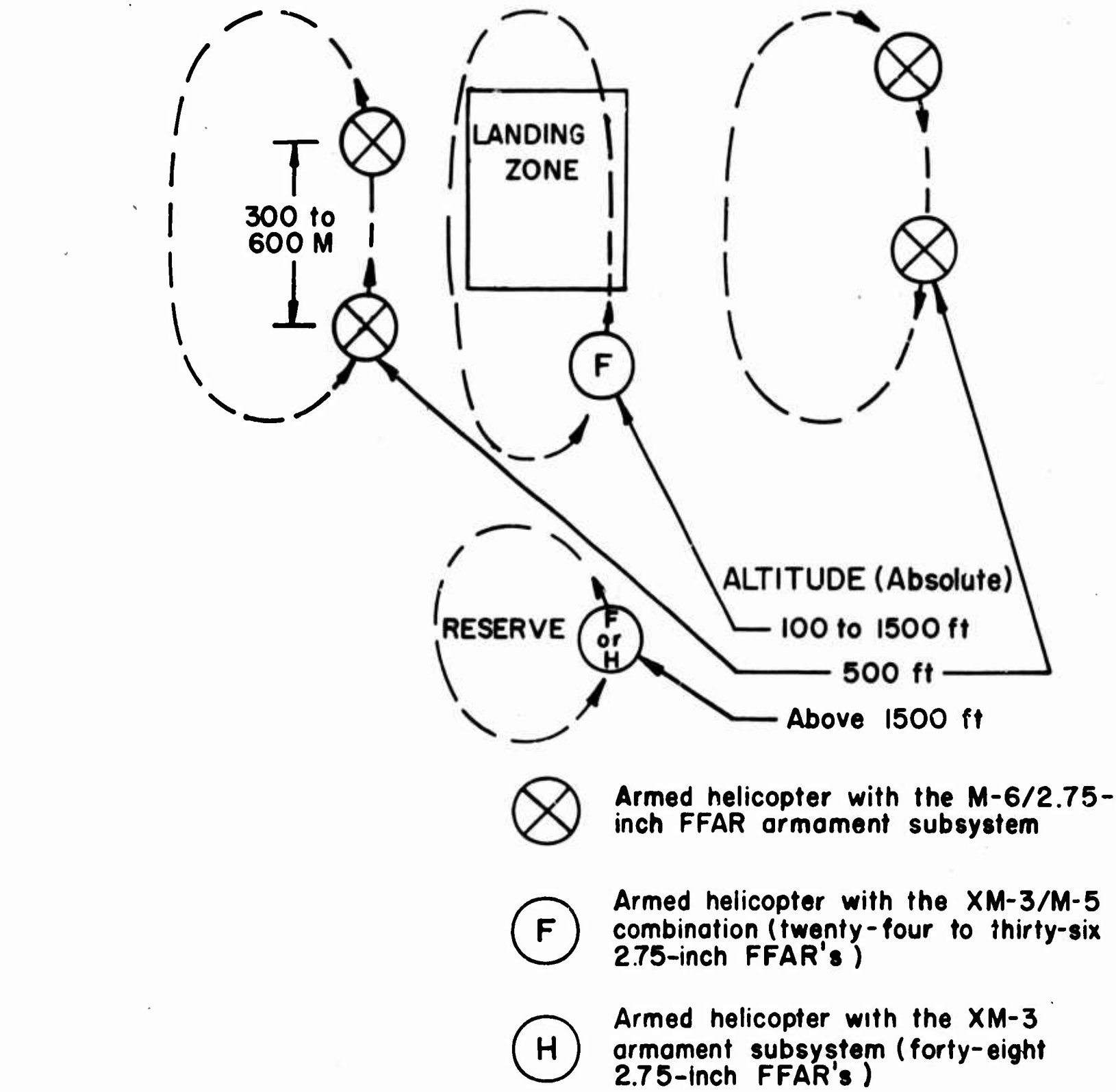
In the IV Corps area, the open terrain allowed tentative selection of LZ's by map study. Here the armed platoon preceded the assault force by 3 to 5 minutes and performed the required reconnaissance with the armed platoon commander recommending a specific LZ to the force commander. The armed platoon commander, flying the XM-3/M-5 equipped helicopter (UH-1B), directed the reconnaissance from the best altitude and position over the LZ. A second XM-3/M-5 helicopter (or XM-3), when available, orbited in the vicinity of the LZ above 1500 feet. (See figure 4.)



(U) FIGURE 2. Visual reconnaissance: II and IV Corps.



(U) FIGURE 3. Reconnaissance of landing zone: II Corps.



(U) FIGURE 4. Reconnaissance of landing zone: IV Corps.

b. Helicopter Prestrike of LZ's

In the II Corps area, hostile fire was anticipated in the selected LZ's and it was often necessary to conduct a helicopter prestrike just prior to the assault landing. The XM-3/M-5 was ideally suited for this mission because of its inherent destructive effect and area coverage capability. (See figure 5.)

In the delta, because of their ready availability, LZ's could be selected that normally did not require a helicopter prestrike. When enemy fire was encountered, the armed helicopters employed suppressive fires or the LZ was changed.

c. Escort Phase

In the II Corps area, armed helicopters normally escorted troop transport helicopters from the staging area to the LZ. The helicopter with the XM-3/M-5 was employed as the lead armed helicopter because of the longer range of the 2.75-inch rockets and the destructive capability of the 40mm round. (See figure 6.)

Within the IV Corps area the troop transport helicopters were normally escorted only from the vicinity of the release point (RP) to the LZ. Light fire teams performed the escort mission. In such operations the armed helicopter equipped with the XM-3/M-5 remained in the vicinity of the LZ and directed the approach of the troop transport helicopter formation. (See figure 7.)

d. Protection of Troop Transport Helicopters in the LZ

Because LZ's were often surrounded by extensive foliage in the II Corps area, a request for suppressive fire could usually be expected. In such instances the XM-3/M-5 was included in a light fire team which was employed in a daisy chain formation to provide maximum suppressive fire for the protection of the troop transport helicopters. (See figure 8.) Landing zones in the IV Corps area were selected in open terrain and a light fire team was capable of providing adequate protection. In these instances the XM-3/M-5 was normally kept in orbit in the vicinity of the LZ and at an altitude above the light fire team. (See figure 9.)

3. Overhead Cover for Ground Operations

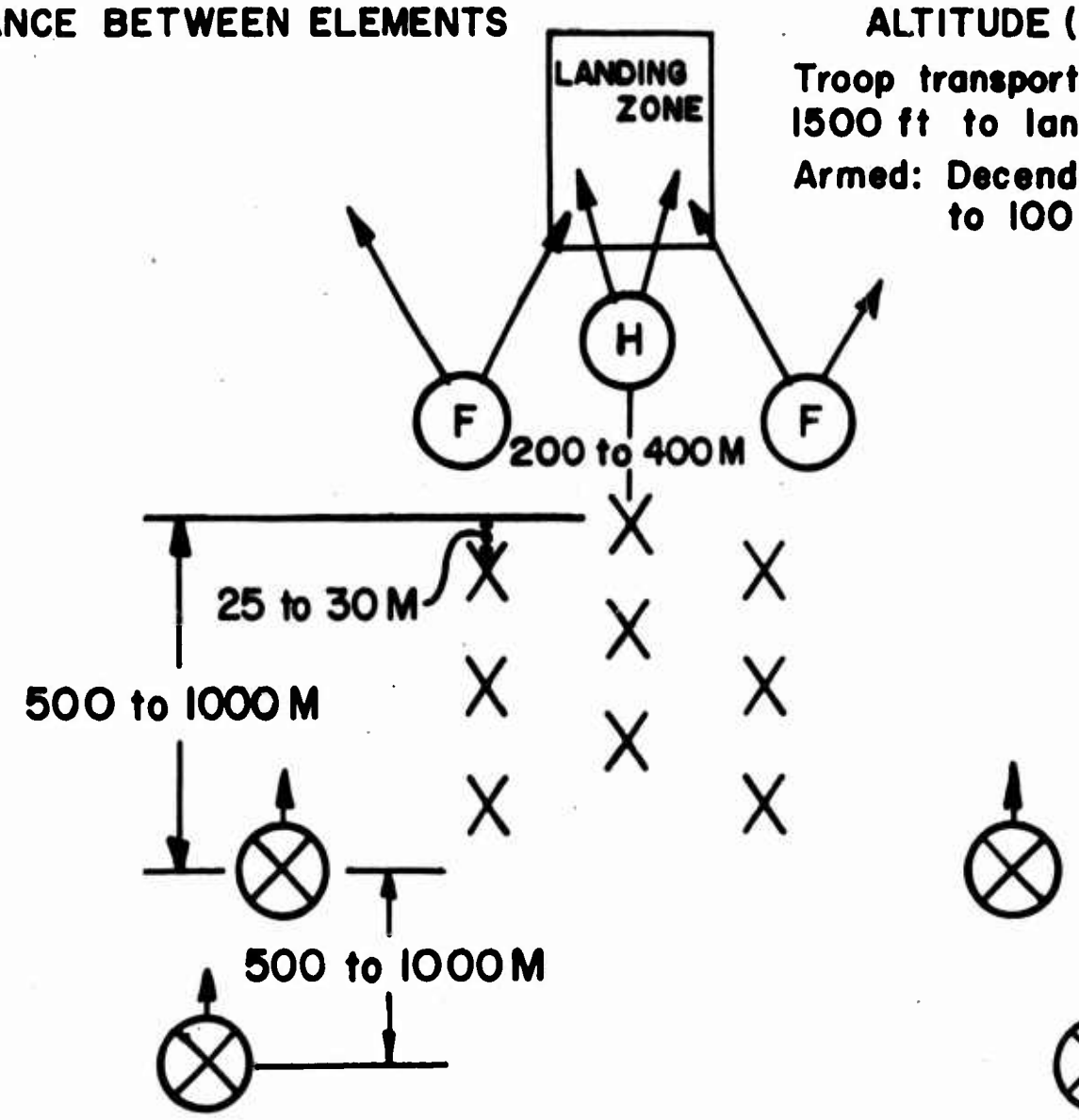
Ground operations with overhead cover were seldom conducted in the II Corps area but were frequently performed in the IV Corps area. The disposition of ground forces usually dictated the technique of employment. The armed helicopter element normally used a daisy chain formation while remaining over friendly forces. The XM-3/M-5 was well-suited for this mission as it could place a large volume of destructive

DISTANCE BETWEEN ELEMENTS

ALTITUDE (Absolute)

Troop transports: Descending from 1500 ft to landing

Armed: Decending from 1400 ft to 100 ft



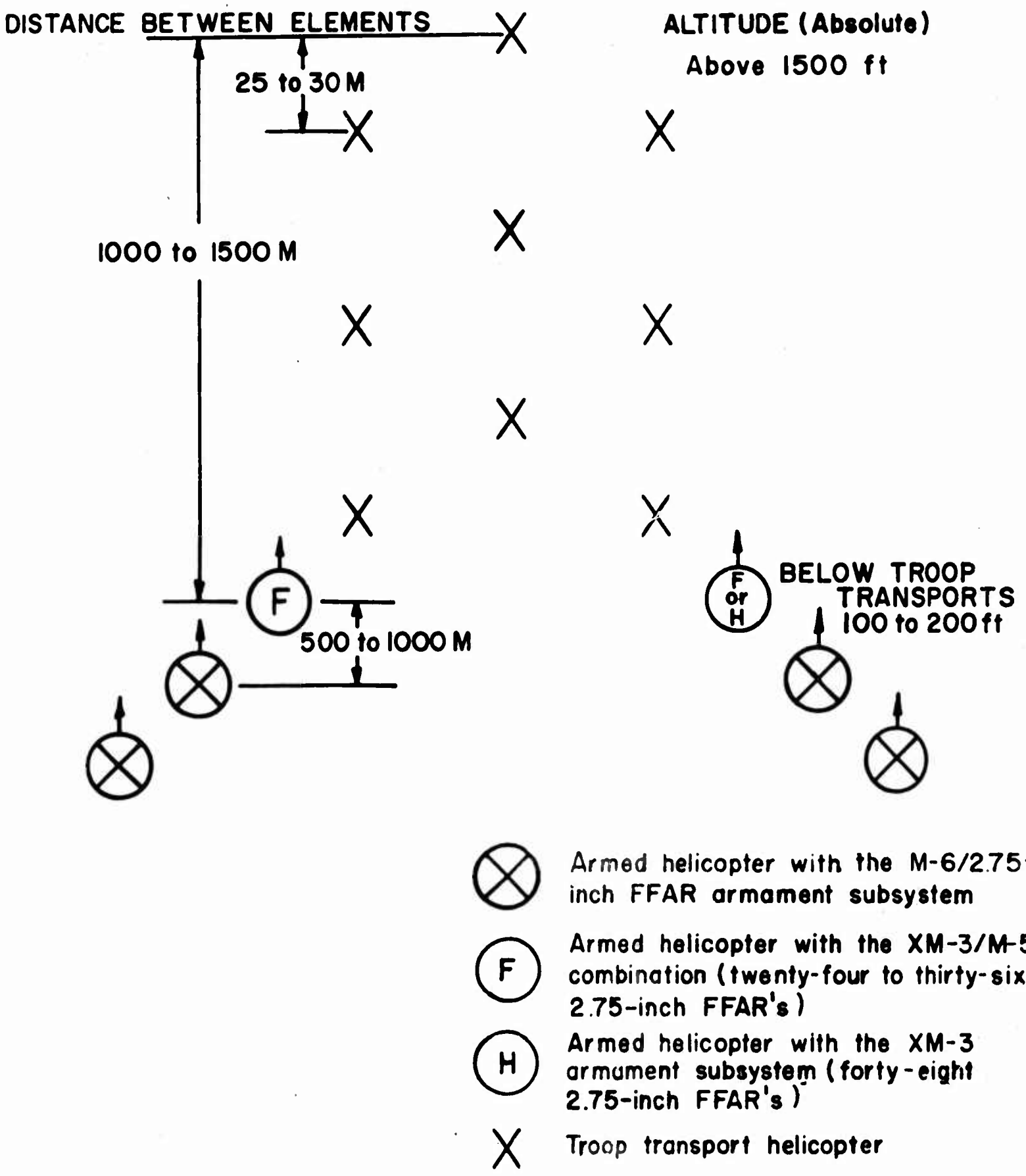
Armed helicopter with the M-6/2.75-inch FFAR armament subsystem

Armed helicopter with the XM-3/M-5 combination (twenty-four to thirty-six 2.75-inch FFAR's)

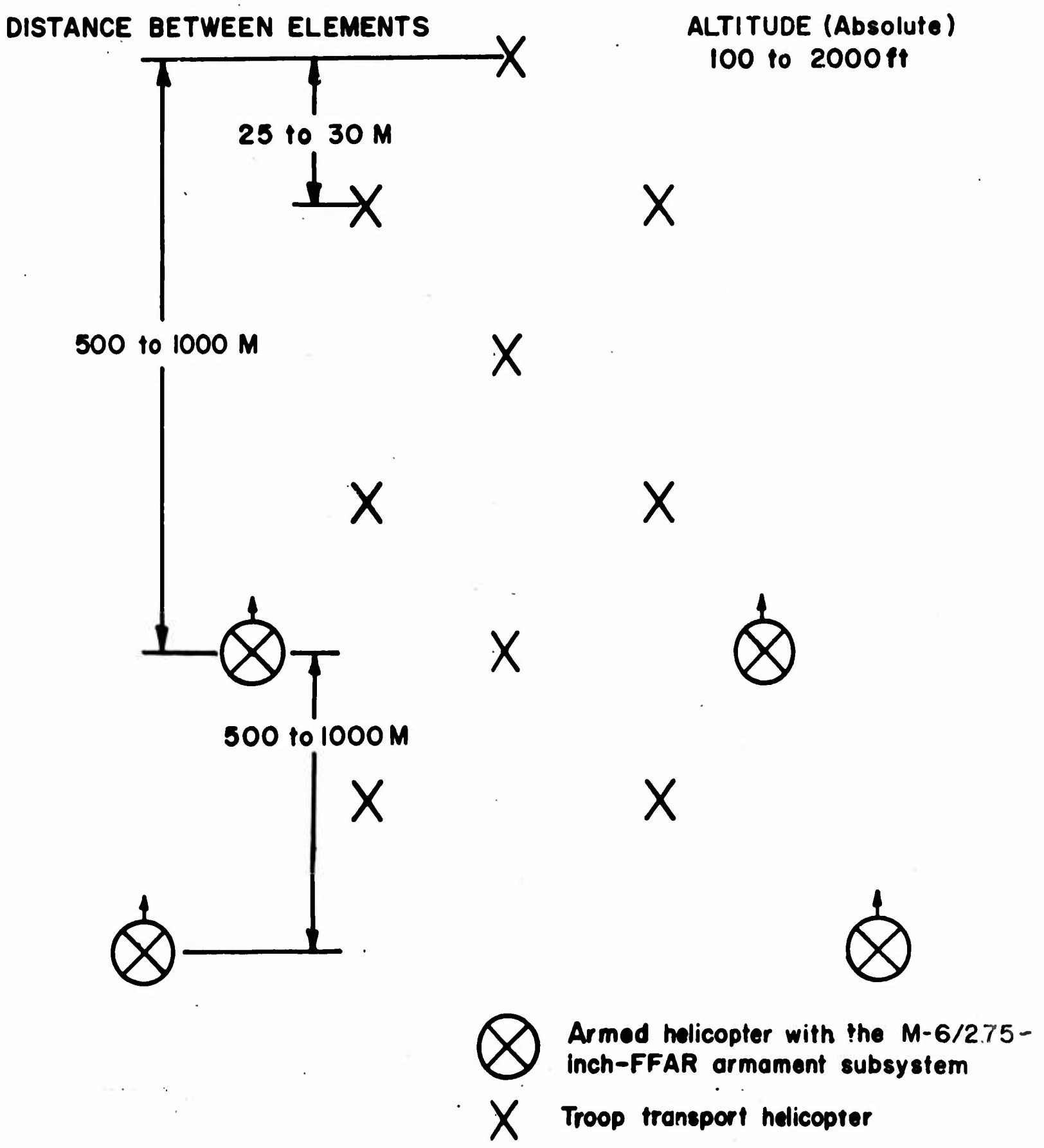
Armed helicopter with the XM-3 armament subsystem (forty-eight 2.75-inch FFAR's)

Troop transport helicopter

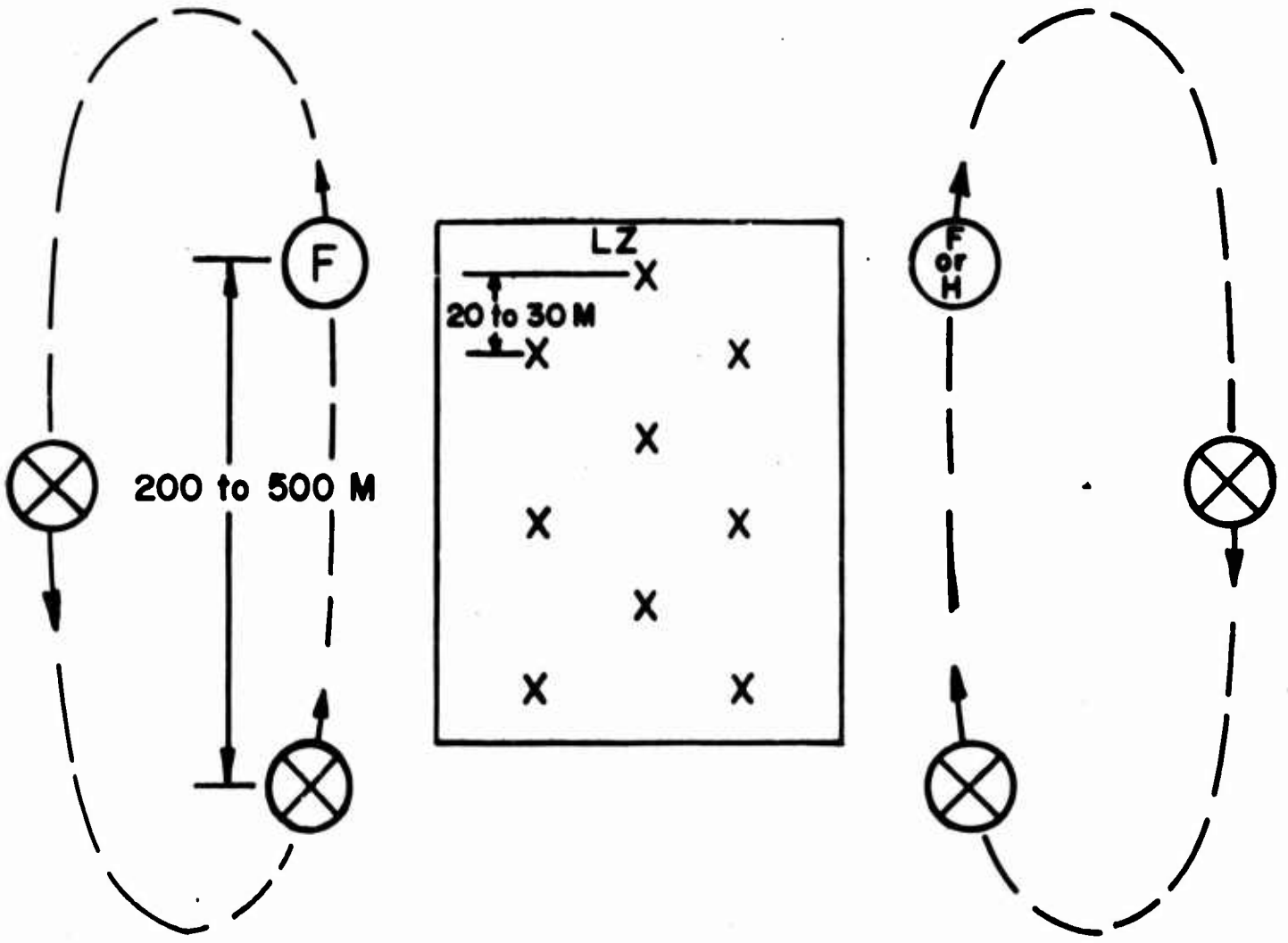
(U) FIGURE 5. Helicopter prestrike in the LZ: II Corps.



(U) FIGURE 6. Escort phase: II Corps.



(U) FIGURE 7. Escort phase: IV Corps.



DISTANCE BETWEEN ELEMENTS

ALTITUDE (Absolute)
TROOP TRANSPORTS: 0 ft
ARMED: 10 to 100 ft

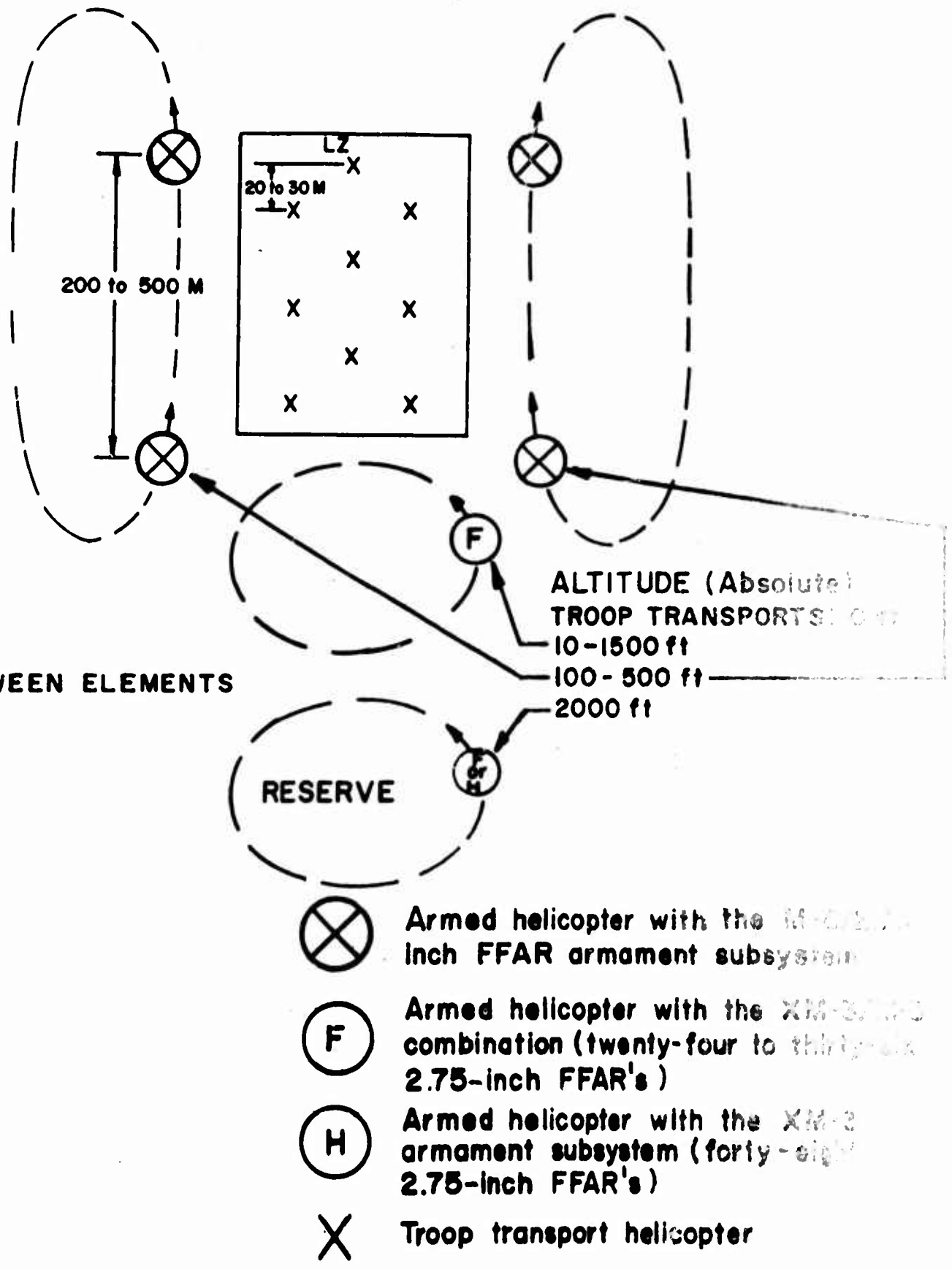
⊗ Armed helicopter with the M-6/2.75-inch-FFAR armament subsystem

(F) Armed helicopter with the XM-3/M-5 combination (twenty-four to thirty-six 2.75-inch FFAR's)

(H) Armed helicopter with the XM-3 armament subsystem (forty-eight 2.75-inch FFAR's)

X Troop transport helicopter

(U) FIGURE 8. Protection of troop transport helicopters in the LZ: II Corps.



(U) FIGURE 9. Protection of troop transport helicopters in the LZ: IV Corps.

fire over wide areas in which enemy forces were holding up the advance of the ARVN ground forces. (See figure 10.)

4. Escort of Troop Transport Helicopters

Escort of troop transport helicopters was frequently conducted in the II Corps area. The XM-3/M-5 helicopter in this role was used as the lead element of a light fire team. (See figure 11.) In the IV Corps area, armed helicopters were used normally to escort only large troop transport helicopter formations. Here, the XM-3/M-5 provided general support for the light fire teams involved. (See figure 12.)

5. Support of Eagle Assault

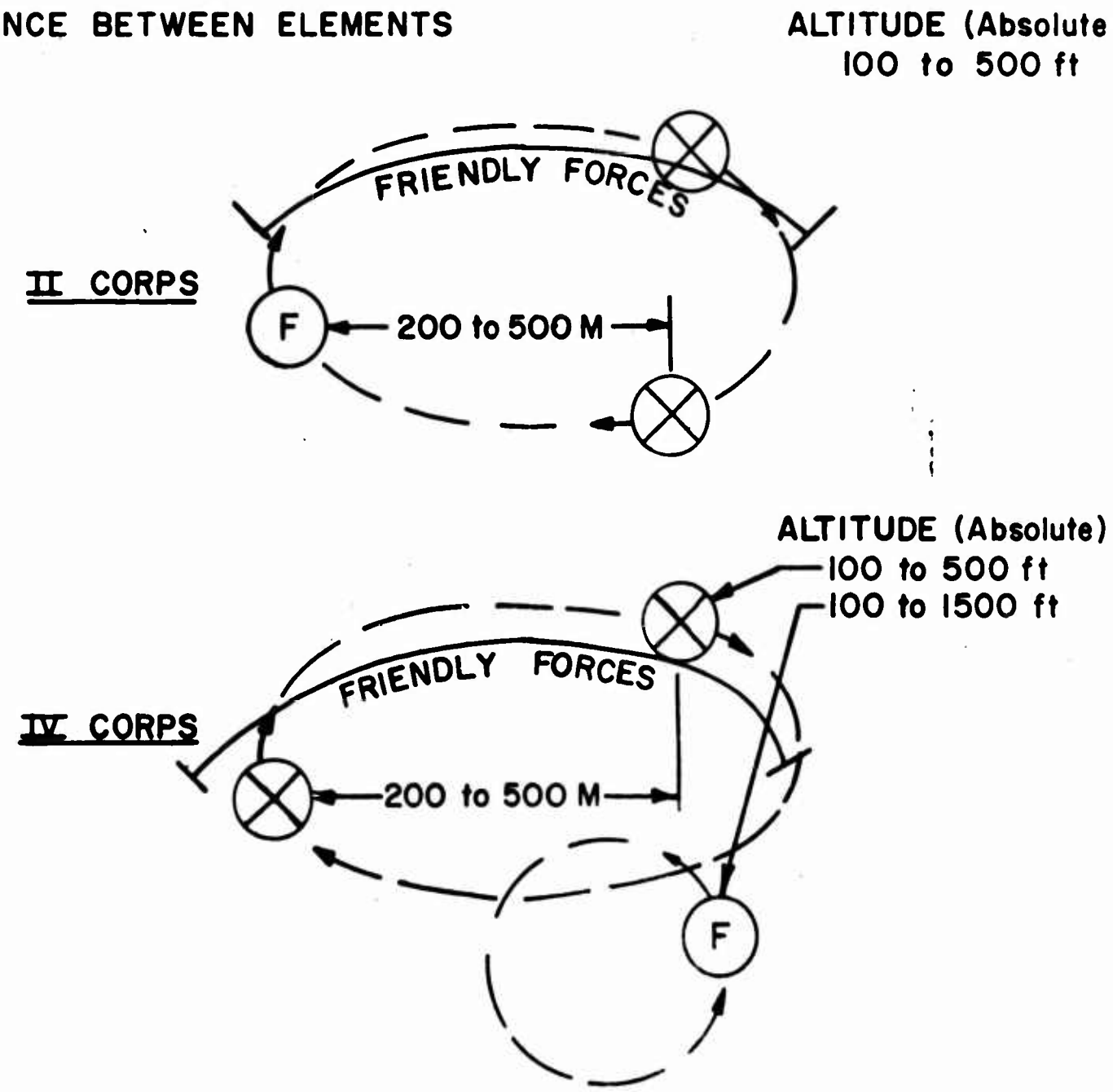
In the II Corps area, an eagle assault, including M-5 employment, was conducted exactly as an airmobile assault except that tentative LZ's were selected from a map study and confirmed by the armed platoon commander just prior to the assault. In the IV Corps area, an eagle assault was conducted exactly as an airmobile assault.

6. Convoy Escort

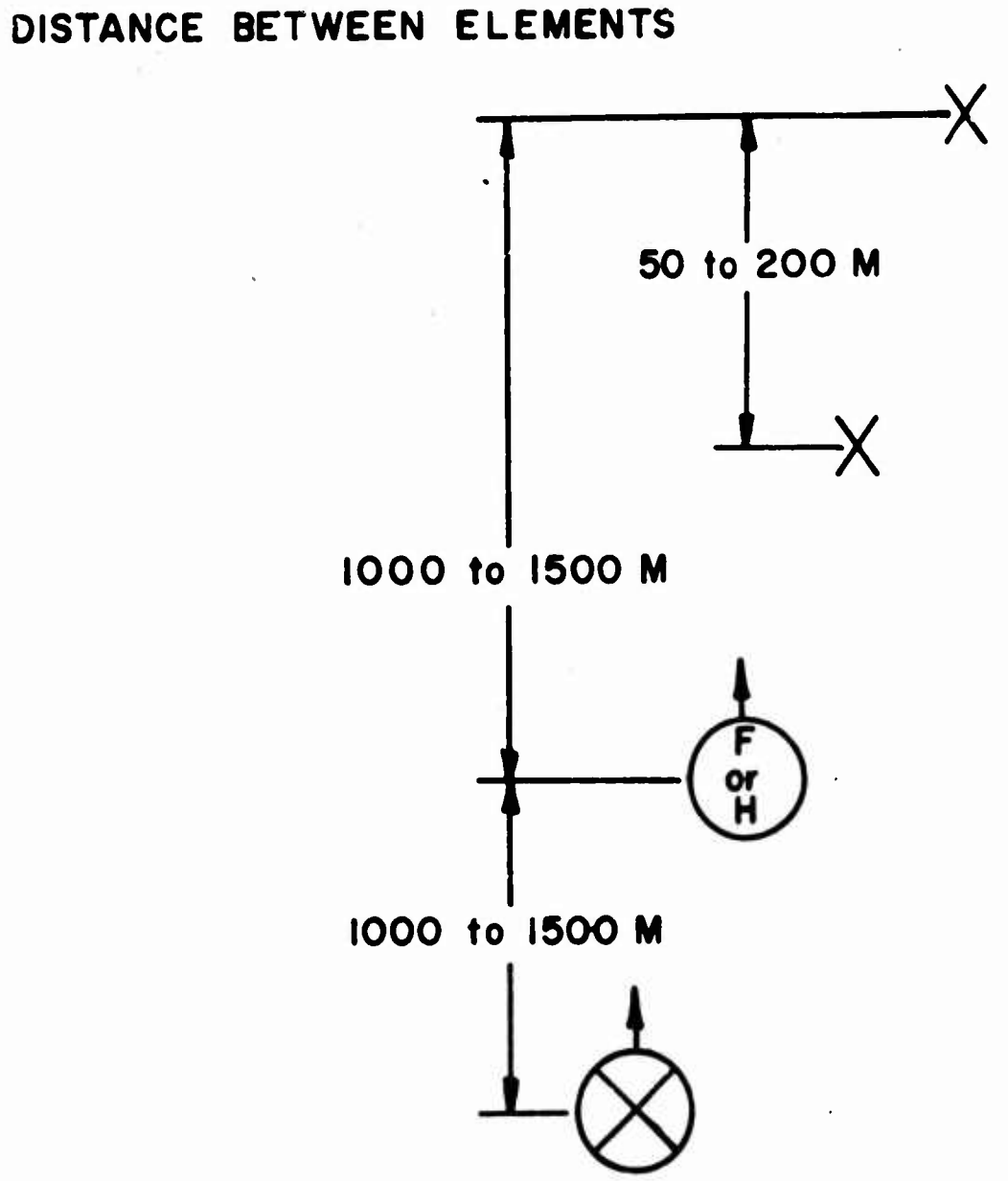
In the II and IV Corps areas, convoy escort was normally conducted by a light fire team armed with the M-6/2.75-inch FFAR system. When the XM-3/M-5 helicopter was used in convoy escort, it was positioned as the lead element in the fire team. (See figure 13.)

7. Armed Helicopter Attack Techniques

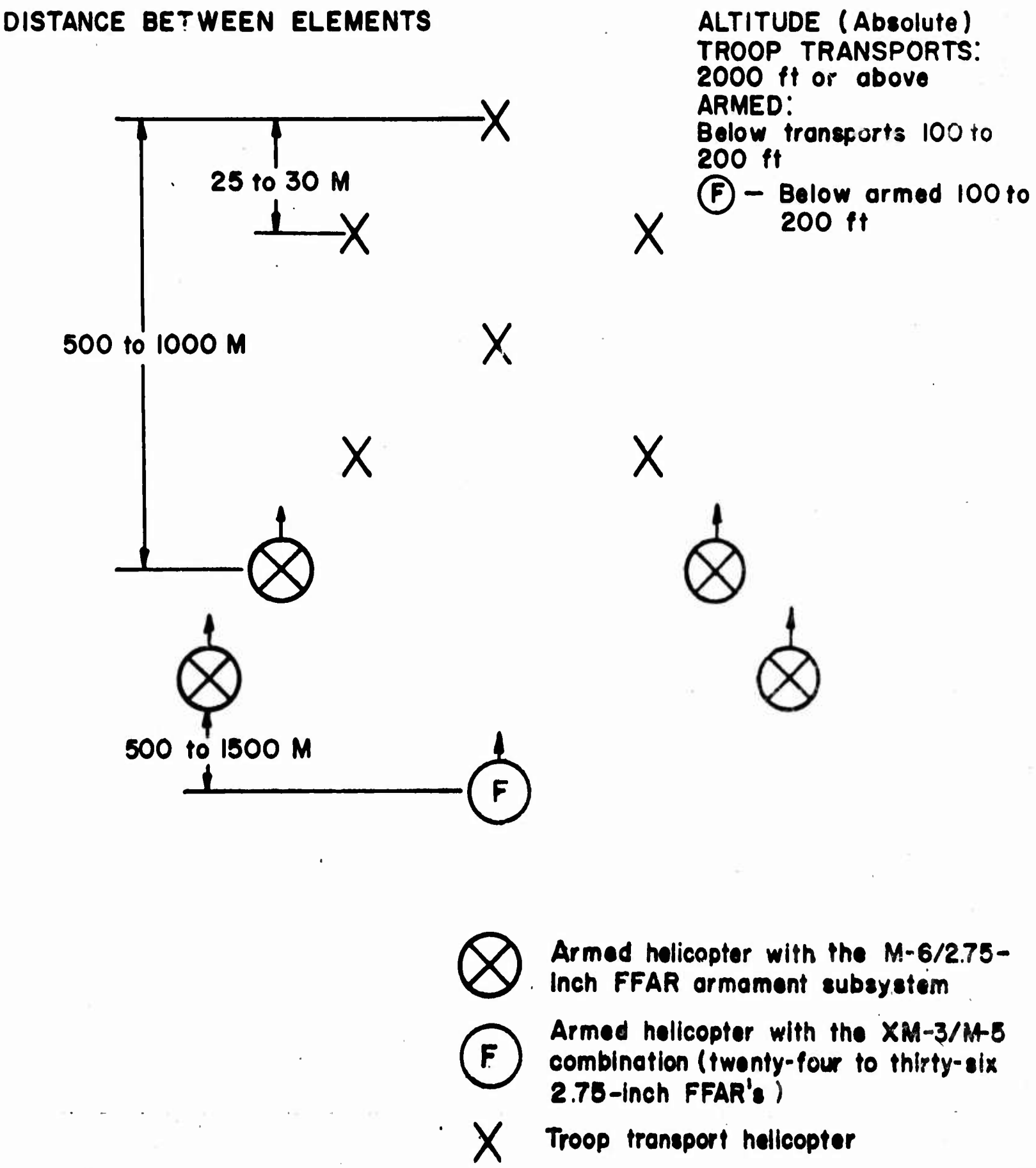
In the II Corps area, helicopter attacks were infrequently employed but, when conducted, the technique of employment was to form all armed helicopters, including the XM-3/M-5 helicopter, in a continuous chain. Firing passes began at 65 to 75 knots airspeed, 1200 to 1500 feet altitude, and 1000 to 1500 meters from the target. The firing passes were terminated at 75 to 85 knots airspeed, 300 to 500 feet altitude, and 300 to 500 meters from the target. (See figure 14.) In the IV Corps area, helicopter attacks were frequently conducted. The technique of employment was to place the helicopters armed with the M-6/2.75-inch FFAR in a continuous chain. The XM-3/M-5 helicopter attacked the target on a different axis up to 60 degrees from that used by the other armed helicopters, thus subjecting the enemy to fire from two directions. The M-6/2.75-inch FFAR-equipped helicopters began target engagement at 70 to 80 knots airspeed, 700 feet altitude, and 1000 to 1500 meters from the target. The firing passes were terminated at 75 to 85 knots airspeed, 500 feet altitude, and 500 meters from the target. The XM-3/M-5 helicopter began target engagement at 65 to 75 knots airspeed, 900 feet altitude, and 1000 to 1500 meters from the target. The firing pass was terminated at 75 to 85 knots airspeed, 700 feet altitude, and 700 meters from the target. (See figure 15.)



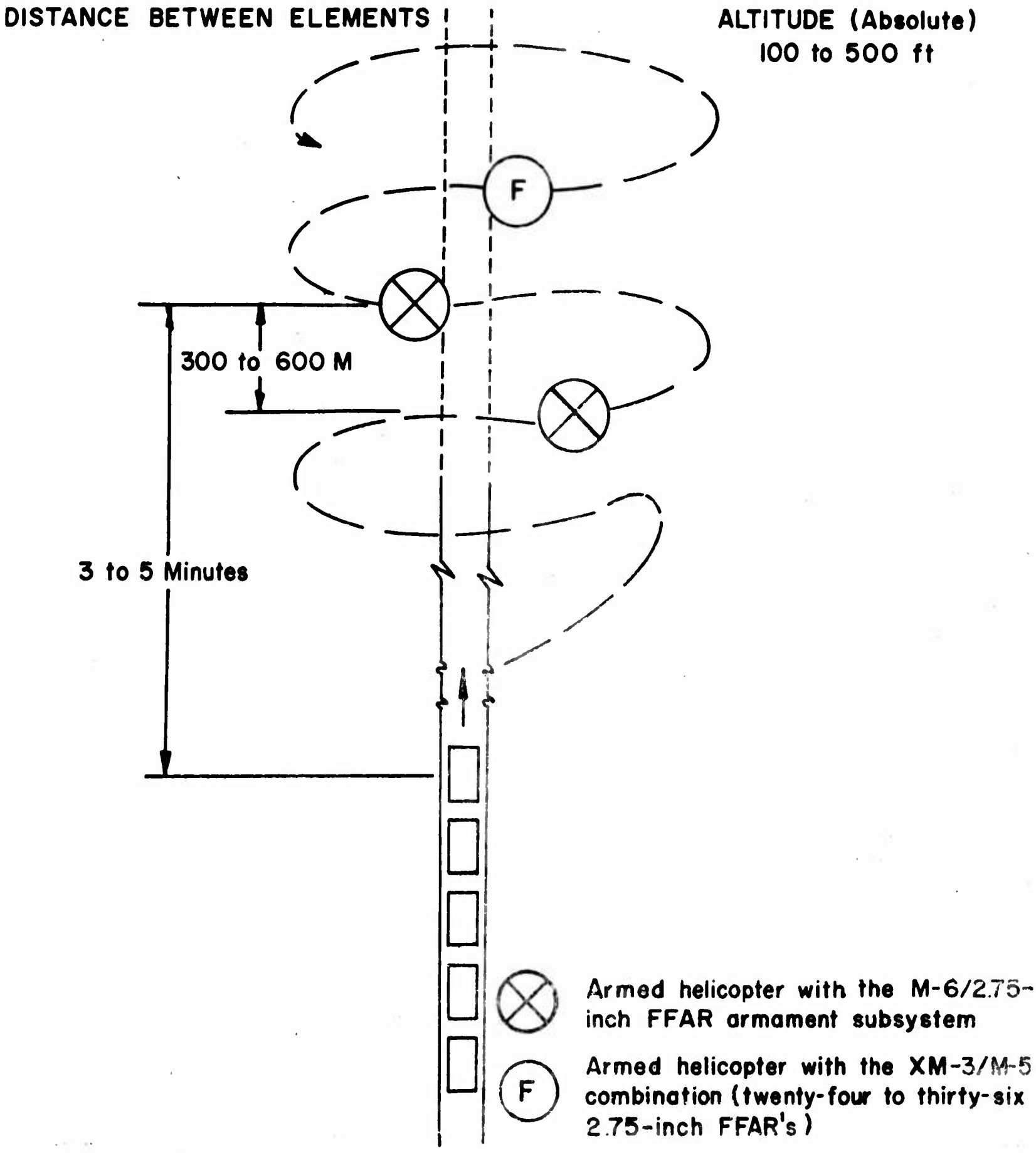
(U) FIGURE 10. Overhead cover for ground operations: II and IV Corps.



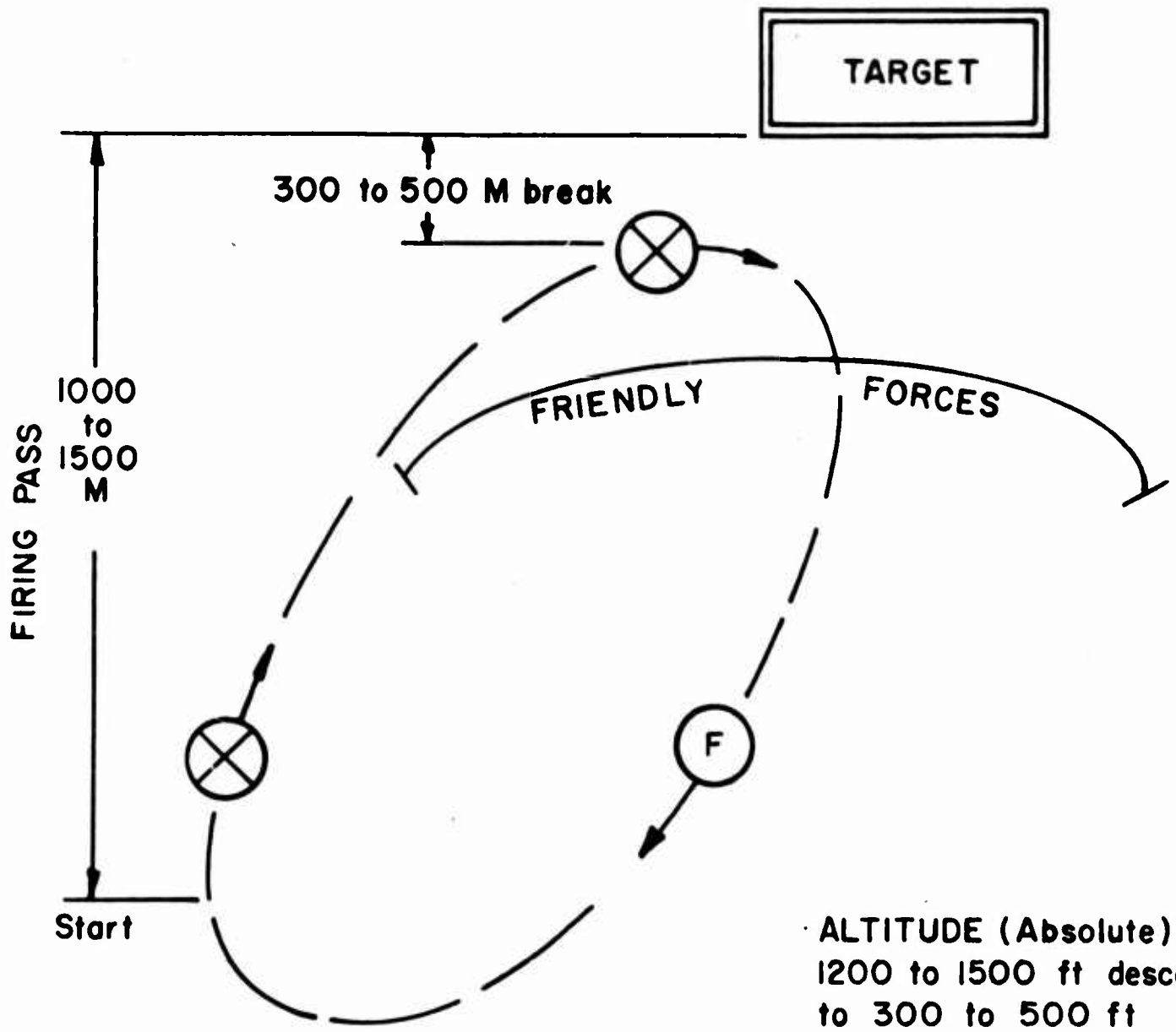
(U) FIGURE 11. Escort of troop transport helicopters: II Corps.



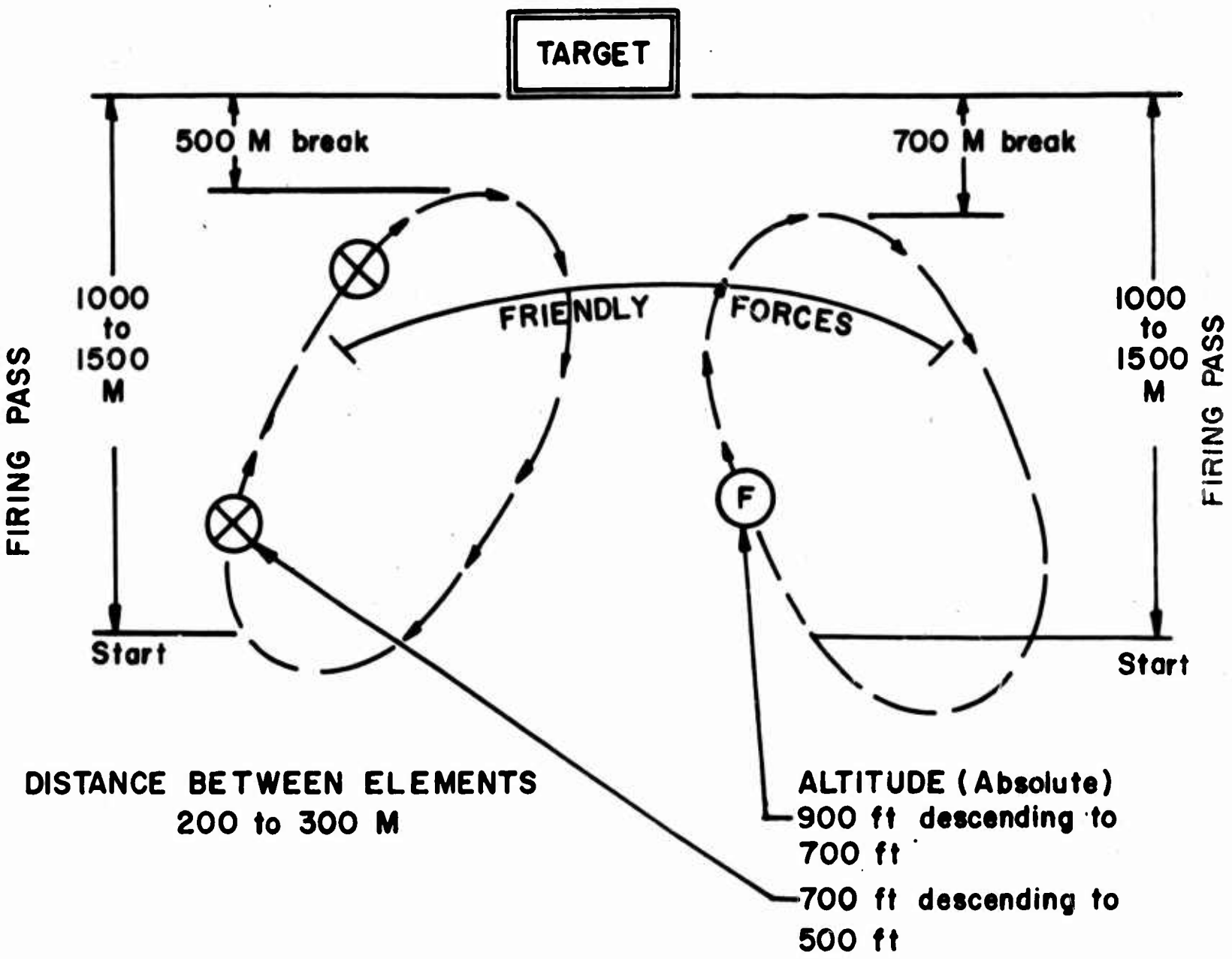
(U) FIGURE 12. Escort of troop transport helicopters: IV Corps.



(U) FIGURE 13. Convoy escort: II and IV Corps.



(U) FIGURE 14. Armed helicopter attack: II Corps.



(U) FIGURE 15. Armed helicopter attack: IV Corps.

In both the II and IV Corps areas, the break was executed to the right whenever possible to allow copilot/gunners of flexible subsystems (M-5 and M-6) to maintain visual contact and weapon tracking of the target for a longer period of time. The M-5 was fired in 3- to 5-round bursts which resulted in the expenditure of approximately 40 rounds during each firing pass.

8. Findings

The M-5 employment techniques varied among the airmobile companies observed during the evaluation. Because of the absence of published doctrine for the employment of the subsystem, all airmobile companies incorporated the M-5 into existing techniques which had been developed based upon the capabilities of the 7.62mm machineguns and the 2.75-inch rockets. This sometimes resulted in techniques which did not consider the capabilities and limitations of the subsystem. However, experimentation was not feasible during combat missions and little time was available for training to develop new techniques of employment. Existing techniques will probably be modified to obtain maximum advantage from the M-5 after it has been employed longer.

B. (C) OBJECTIVE 2 - OPERATIONAL CAPABILITIES, LIMITATIONS, AND COMBAT EFFECTIVENESS

1. Operational Capabilities

a. Subsystem Features Enhancing Operational Capabilities

The M-5's capability to engage targets up to 60 degrees each side of the aircraft flight path enhanced its effectiveness. This lateral traverse plus the ability to depress the muzzle 35 degrees allowed the copilot/gunner to fire during the break when the helicopter was most vulnerable to enemy fire. The M-5 was normally operated in the flexible mode. (See annex F, paragraph 2.) The stow mode was seldom used as it was designed primarily to provide the pilot with an emergency capability to fire the subsystem.

b. Suppressive and Area Fire

The requirement for employing suppressive fire frequently exists in counterinsurgency warfare because enemy positions are difficult to locate. This was particularly true during the evaluation in the dense foliage and extensive jungle canopy of II Corps but suppressive fires were also employed in the IV Corps area as the insurgents had become experts in the art of camouflage even in the flat delta terrain.

(1) Effectiveness

When targets could not be identified, suppressive fires were employed to reduce enemy fire on unarmed helicopters and to degrade the effectiveness of enemy fire on friendly ground forces. In areas other than dense jungle, the M-5 was effective in the suppressive fire role against VC in tree lines in the edge of forested areas and adjacent to canals, in areas covered with trees not over 30 feet in height, in buffalo grass, and in rice fields. The effective area covered was approximately 200 x 200 meters. The 40mm HE round, with its loud explosion and extensive fragmentation, caused the enemy to withdraw into foxholes, thereby decreasing his ability to employ effective fire against advancing air lifted or ground forces. Additionally, the burst of the projectile removed camouflage, thus revealing the location of some enemy positions.

(2) Employment Ranges

Although the M-5 can deliver suppressive fires from ranges of 100 to 1700 meters and from altitudes of 100 to 1500 feet, the maximum effective range was considered to be about 1200 meters with the helicopter in a 70 to 80 knot attitude. Greater ranges (1200 to 1700 meters) could be obtained by changing the attitude of the helicopter to a nose high position (50 to 60 knots airspeed) but in this attitude, accuracy was sacrificed for greater range.

c. Neutralization and Destructive Fires

(1) Personnel in the Open

Insurgent personnel and equipment were difficult to locate and identify from the air. Whenever targets were identified, the M-5 was effectively employed in the neutralization and destructive fire roles. The M-5 was extremely effective up to 1200 meters against personnel in the open because of great fragmentation of its HE round. For an example, a US sector advisor inspected an area where the M-5 had been employed and stated, "The area was literally peppered with small fragments from the M-5 HE projectile." In another instance, reported on 4 July 1965, the US advisor with the 3rd Battalion, 33rd Regiment, 21st ARVN Division observed M-5 rounds landing in an area with numerous VC in the open and reported, "It was the same as an extremely heavy mortar attack and I could see parts of bodies and debris flying through the air."

(2) Partially Protected Personnel and Materiel

Although more effective against personnel in the open, the M-5, when employed within 700 meters, was effective against dug-in personnel without overhead cover, thatched huts, and ammunition and

equipment storage areas. During the evaluation 30 thatched huts were destroyed. During the 4 July 1965 operation cited above, the US advisor reported that VC killed in foxholes had multiple small wounds in the head and shoulders. Also, on one operation, one VC was observed in tall grass approximately 10 feet high. Ten M-5 rounds were fired into an area 50 x 50 meters and inspection from the air revealed that three VC had been killed.

The M-5 is not a point target weapon but it effectively neutralized enemy machinegun and mortar positions without overhead cover and destroyed sampans when saturation fire was employed within 700 meters. During the evaluation 15 sampans were destroyed, 5 of which were sunk on one operation.

d. Operational Capabilities Not Evaluated

(1) Night Employment and Destruction of Vehicles

The effectiveness of the M-5 subsystem during the hours of darkness and its capability to destroy vehicles were not evaluated. The 40mm high explosive round was designed for employment against lightly armored vehicles but targets of this type were not encountered. The M-5 was not evaluated at night owing to infrequent night operations. It was, however, successfully employed once during the evaluation at night. Details on this night operation are shown in annex A, operation on 28 July 1965.

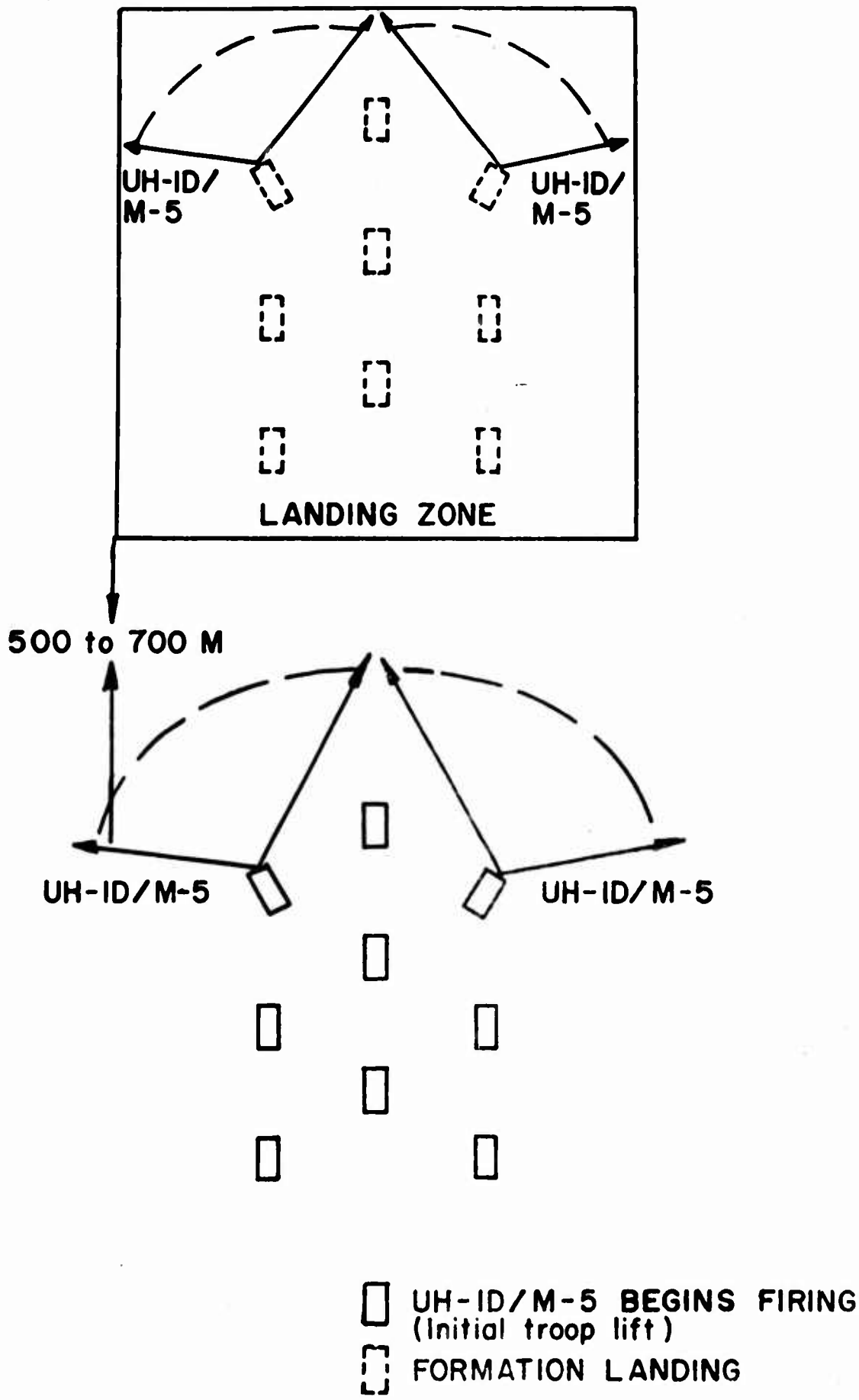
(2) M-5 Mounted on Troop Transport Helicopters

The operational capability of the M-5 mounted on troop transport helicopters (UH-1D) was not evaluated. There was no kit for mounting the system on the UH-1D. However, the requirement to install the M-5 on troop transport helicopters has been recognized and USARV has recommended the development of a B kit (aircraft) for the UH-1D.

The M-5, with its 120-degree traverse and its accuracy at short ranges, could provide additional close-in protection for troop transport helicopters arriving and departing LZ's. The current concept would use the UH-1D/M-5 on the first troop lift of airmobile and eagle assault missions. Two helicopters, right and left wing positions of the lead troop carrying element, would be M-5 equipped and would employ suppressive fires, coordinated by the armed platoon leader, to the right and left flanks with an overlap to the front. (See figure 16.)

2. Operational Limitations

The design criteria under which the M-5 was developed specified a lightweight, short-range, area-fire system to be mounted on troop transport helicopters. The role of the helicopter has undergone several stages



(U) FIGURE 16. Proposed employment of M-5 mounted on the UH-1D.

of evaluation since these criteria were established and the subsystem was produced. The role of the armed helicopter as presently employed was probably not foreseen when the subsystem was designed. For example, its short range design characteristic has become an operational limitation in the RVN. This was even more pronounced when the subsystem was used on helicopters in the armed platoon. With the increased effectiveness of the Viet Cong to employ automatic weapons, armed helicopters had to engage targets at longer ranges (1500 meters) and execute a break at a reasonably safe distance (500 meters).

a. Factors Affecting Employment Techniques

Employment of the M-5 weapon system was influenced by the low muzzle velocity of the projectile, the absence of a tracer/marking round, the limited number of range graduations, the lack of deflection graduations on the sight reticle, inability of the sight mount to compensate for recoil-induced vibration and aircraft roll, and the lack of sufficient height adjustment of the sight which rapidly induced copilot/gunner fatigue. In addition to these factors, the problem areas discussed below have a direct bearing on operational employment.

(1) Copilot/Gunner Training

Combat commitments of armed platoons in RVN do not usually allow sufficient time for the copilot/gunner to achieve the required degree of proficiency through preliminary unit training. In addition, the training of copilot/gunners was aggravated by the requirement for successive and accurate estimation of range and the ballistic characteristic of the projectile (low muzzle velocity and high arc).

(2) Range Estimation

Range estimation is difficult on the ground and errors are compounded when flying a helicopter under combat conditions. Correct range estimation was a major factor in the copilot/gunner's ability to place accurate fire on the target. Range error was sometimes 500 to 700 meters when engaging targets from 1200 to 1700 meters, while under the same conditions, the deflection error was only 100 to 200 meters.

(3) Ammunition Capacity

Armed helicopters often remained on station for as much as an hour and a half when supporting airmobile operations, and often were required to deliver fire on enemy targets several times during the period. The M-5, with its present ammunition capacity of only 150 rounds, expendable in approximately 37 seconds of sustained fire, did not possess the ammunition capacity desired for armed helicopter operations. An increased ammunition capacity (175 round box plus the 75 rounds in the ammunition chute) was required for the M-5 when mounted on armed helicopters.

The present 75-round ammunition box with 75 rounds in the chute should be adequate when the M-5 system is mounted on troop transport helicopters as they are not required to remain on station for an extended period of time.

(4) Ammunition Reloading Time

Armed helicopter support may be desperately needed at any time during ground operations. It is essential that these aircraft remain on station as long as possible and, therefore, refueling and reloading time must be reduced to the minimum. Normally the M-5 reloading time (15 minutes) was satisfactory even though each individual round of ammunition had to be carefully inspected for loose links and long rounds. Occasionally it was found that the ogive of the projectile was loose and the round had to be replaced.

Reloading time was doubled and even tripled when the ammunition loader (loading cable) became stuck in the flexible chuting. To free the loader required removing the protective tape, freeing the loader by hand, and retaping the flexible chuting.

(5) Center of Gravity Limit

When the M-5 is installed on a UH-1B, a potential problem exists with the forward center of gravity (CG) limit, especially with low fuel and a full load of M-5 ammunition. This results from the M-5 ammunition being stored forward of the helicopter CG, the turret installed 3 inches forward of the nose of the helicopter, and the practice of loading the maximum ordnance on armed helicopters in order to achieve a longer time on station. United States Army, Vietnam has recognized this problem and in the Aviation Accident Prevention Bulletin, 31 August 1965, cautioned aviation units in RVN to closely monitor loading of the M-5 helicopter for combat missions. The bulletin stated that all UH-1B helicopters with M-5 subsystems have a critical CG; that allowable limits of CG will be exceeded when low fuel remains on board and M-5 ammunition has not been expended, or when carrying an excess of four persons on board plus the large combat load of ammunition. To overcome this safety hazard, it is mandatory that a weight and balance check be accomplished prior to the M-5 installation and that units refrain from extended operation with a low fuel condition and a full M-5 ammunition load. Although a problem, no accidents occurred during the evaluation which were attributed to allowable CG limits being exceeded.

b. Employment Limitations

(1) Employment over 700 Meters

At ranges greater than 700 meters, accurate fire was difficult to achieve and as the range to the target increased, accuracy decreased. At ranges over 1200 meters, the projectile sometimes missed

the target by as much as 500 to 700 meters. To offset this disadvantage, it was necessary to fire a large number of rounds to saturate the area.

(2) Employment under 700 meters

The desired degree of accuracy could be obtained at ranges less than 700 meters but this allowed the delivery of accurate fire for a distance of only 100 to 200 meters (7 to 8 seconds of fire) prior to initiation of the break. As the helicopter began to turn away from the target, the desired degree of accuracy could no longer be sustained and only area fire was possible.

(3) Immediate Reaction Role

The M-5 was not effective when immediate reaction was required (escort missions) because of the low muzzle velocity of the projectile. The objective of the armed helicopter in this role was to place immediate fire on the target area to neutralize or suppress enemy fire or, as a minimum, make the enemy aware that he is being fired upon. The 40mm grenade fired from an altitude of 1000 feet and at a range of 1500 meters (altitude and range normally used for escort missions) required approximately 10 seconds for the projectile to impact. This delay was unacceptable when enemy fire had to be neutralized to prevent damage to the helicopters.

(4) Close-in Support

Vietnamese ground commanders have found that armed helicopters provide immediate response and can place neutralization and destructive fires in close proximity to friendly forces. Therefore, armed platoons are frequently employed to provide such support. The M-5 can deliver close-in fires at ranges less than 700 meters. However, at greater ranges, such fires could not be provided because of sighting limitations and errors in range estimation unless the disposition of friendly and enemy forces would permit target attacks parallel to the front line of the friendly ground forces.

3. Combat Effectiveness

The XM-3/M-5 combination armament subsystem was effectively employed during daylight hours in the counterinsurgency role and provided the aviation commander with a weapon which partially filled the gap between the 7.62mm machinegun and the 2.75-inch FFAR. The subsystem was the most effective against personnel in the open but it was also effective against sampans, thatched huts, ammunition storage areas, and weapon positions without overhead cover. The M-5 was evaluated only on armed helicopters but the requirement to mount the M-5 on the UH-1D was recognized. The system was not evaluated at night because there was only one night ground operation during the evaluation period.

4. Findings

The M-5, when employed in areas other than dense jungle, was capable of providing effective suppressive fires and neutralization of personnel up to 1200 meters. In addition, the M-5 was capable of neutralization and destructive fires within 700 meters against material, sampans, and personnel in dug-in positions without overhead cover. It was effective against both large area targets, up to 200 x 200 meters, and small area targets, such as machinegun and mortar positions without overhead cover.

Limitations of the M-5 weapon system were the continual requirements for successive and accurate range estimation, lack of copilot/gunner training, low muzzle velocity of the projectile, the absence of a tracer/marking round, and numerous sight limitations.

C. (C) OBJECTIVE 3 - EQUIPMENT AND PERSONNEL REQUIREMENTS

It was unrealistic to attempt to isolate requirements for the individual M-5 subsystem. During the evaluation, therefore, a review was conducted of the overall equipment and personnel requirements for the armed platoon.

1. Equipment Requirements

a. M-5 Subsystems Authorized

Currently USARV authorizes two M-5 armament subsystems in each airmobile company and both have been mounted. The M-5 distribution schedule is shown in annex G.

b. Combination of Armament Subsystems

The M-5 armament subsystem, as initially designed, may be effectively used as a single subsystem on a troop transport helicopter. When used in the armed platoon, however, it should be combined with a complimentary armament subsystem. In the RVN, the XM-3 was combined with the M-5, which provided the long range, relatively accurate, and destructive fire capability of the 2.75-inch rocket together with the sustained fire capability, flexibility, and extensive fragmentation of the 40mm projectile. It was considered less desirable with existing helicopters to combine the M-5 subsystem with the M-6/2.75-inch FFAR subsystem since the 7.62mm machinegun and the 40mm grenade launcher (M-5) have similar range and traverse capabilities. Although it would be highly desirable to have multiple weapon subsystems mounted on a single helicopter, the weight carrying capability of existing helicopters limits the total number of systems that can be employed. Therefore, to provide maximum effectiveness, weapon subsystems with similar capabilities should not be mounted simultaneously on helicopters in the present inventory.

c. M-5 Subsystems Required for Armed Platoon

The six helicopters with M-6/2.75-inch FFAR currently authorized in the armed platoon are sufficient to perform the reconnaissance role. Prior to the introduction of the M-5, the XM-3 provided suppressive and destructive support for the M-6/2.75-inch FFAR reconnaissance elements. The M-5 augments the capability of the XM-3 by providing flexibility, extensive fragmentation, and sustained fire power. Based on this philosophy the optimum organization recommended for the armed platoon is six helicopters with the M-6/2.75-inch FFAR and three helicopters with the combination XM-3/M-5 subsystem.

d. M-5 Subsystems Required for Troop Transport Platoon

Each troop transport helicopter platoon should have the capability of close-in area fire support in the vicinity of the LZ. This could be achieved by authorizing these platoons one M-5 and one additional B kit (aircraft) which would permit interchange of the M-5 between two helicopters. This installation will not appreciable reduce the troop carrying capacity of the UH-1D as used in RVN because the majority of missions are short range and, when necessary, the added weight of the M-5 can be offset by a reduction in the fuel load.

e. Backup Subsystem

Owing to lack of available maintenance support and the requirement for immediate replacement of an unserviceable subsystem, an unmounted backup subsystem is recommended in addition to the five mounted subsystems. The backup subsystem should include gun, turret, sighting station, flexible chuting, control box, and servo amplifier junction box assembly.

2. Personnel Requirements

a. Airmobile Company Authorization

Personnel to maintain individual weapons or armament subsystems, except for the supply sergeant who was also designated as an armorer, were not authorized by TOE 1-77E, Airmobile Company (Light), Aviation Battalion, Airmobile. United States Army Pacific Command General Order 262, dated 20 August 1965 augmented this TOE and authorized one unit armorer, E-4, MOS 76K30; two aircraft armament repairmen, E-4, MOS 45J20; and one senior aircraft armament repairman, E-5, MOS 45J20.

b. Armorers

Even though armorers were authorized by augmentation during the evaluation, they were sometimes not available. Aircraft armament

personnel are vital to company operations and should be organic.

c. Ammunition Handlers

During the evaluation, there were no personnel authorized by TOE or augmentation to receive, store, and distribute the tremendous amount of ammunition used by an airmobile company. As an example of the need for ammunition handlers, during one operation (36 hours duration), the ammunition usage was 160,000 rounds of 7.62mm, 800 rockets (2.75-inch), and 655 rounds of 40mm. Ammunition handlers were required on a continuing basis in the airmobile company.

d. Proposed Authorization Airmobile Company

The present TOE for the airmobile company was not designed to accomplish the current mission in RVN and a new TOE should be prepared. Each airmobile company should be authorized by TOE the following personnel: one unit armorer, E-4, MOS 76K30; two aircraft armament repairmen, E-4, MOS 45J20; one senior armament repairman, E-5, MOS 45J20; and three ammunition handlers, E-4, MOS 55A10.

e. Proposed Aircraft Armament Field Maintenance Detachment (DS)

There was no aircraft armament field maintenance capability within the aviation battalion area. To obtain turret and other major component repair, aircraft armament personnel were required to travel to Saigon from as far away as 422 nautical miles. In view of the current number of authorized armament subsystems and with the proposed increase in M-5 subsystems, a TOE aircraft armament field maintenance detachment was required within the aviation battalion area. This detachment could have been used most effectively by attaching it to one of the aviation maintenance units within the aviation battalion area. See annex D for a proposed TOE detachment.

f. Proposed Interim Aircraft Armament Field Maintenance Platoon (DS)

As an interim measure, until proposed aircraft armament detachments would become available, an aircraft armament field maintenance platoon composed of two teams could be deployed in RVN. Each team would be positioned in an appropriate location with one supporting I and II ARVN Corps areas and the other supporting III and IV ARVN Corps areas. See annex D for a proposed interim organization.

3. Findings

The M-5 subsystem, although evaluated only on armed UH-1B's, should be mounted on designated UH-1D helicopters. Each airmobile company required a total of six M-5 subsystems. Aircraft armament personnel

for the airmobile company authorized by augmentation were required on a continuing basis as were the ammunition handlers. An armament field maintenance detachment was required as part of the aviation battalion. As an interim measure, an aircraft armament field maintenance platoon with teams deployed at appropriate locations in RVN is required to support airmobile units.

D. (C) OBJECTIVE 4 -- LOGISTICAL SUPPORT

1. Subsystem Malfunction Rate

During the evaluation, 5914 40mm HE rounds were fired with 18 malfunctions during 40 combat operations, giving a malfunction rate of .003. The malfunctions were mainly attributed to improper ammunition quality control and the lack of a cover for the rear ammunition chute. Ammunition and metallic links accounted for 11 of the 13 malfunctions, while only 7 were attributable to the subsystem. See annex F for a detailed listing of malfunctions.

2. Subsystem Deficiencies

One deficiency was discovered during the evaluation. With the main power switch on, the gun fired when the gun power switch was activated. This action happened even though the firing button on the cyclic sticks and the grenade launcher trigger switch on the hand control sight assembly had not been depressed. This deficiency was caused by an electrical short between two wires in one portion of the aircraft wiring harness. When these two wires made contact, the short caused the gun to fire when the gun power switch was activated. As an interim fix, one cannon plug from the helicopter wiring harness to the control panel was disconnected in all M-5 subsystems in RVN. The subsystem could still be operated from the hand control sight assembly but was inoperative in the stow mode. The deficiency was reported to US Army Weapons Command for corrective action.

3. Subsystem Shortcomings

Several shortcomings were detected during the evaluation. Some were the direct cause of malfunctions while others made the subsystem more difficult to operate and maintain. One problem which initially appeared to be a feeding problem was actually attributed to improper adjustment of the electrical limit switch actuator which allowed the gun to strike the fixed mechanical stop. If the gun were held deliberately against the mechanical stop and fired, the grenade launcher bounced back and forth against the stop. This action broke or stretched the ammunition links, which prevented feeding. A listing of shortcomings is shown in annex C.

4. Repair Parts Requirement

Technical Manual 9-1010-207-12 (Appendix IV, Section II), dated 28 January 1965, for the M-5 subsystem did not authorize, at organizational level, all of the necessary repair parts. Experience showed that it was highly desirable to authorize at organizational level those items listed below:

Turret Assembly

Description	FSN	Recommended 15 Days Maintenance Allowance Per Subsystem
Pin assembly, quick release (11014514)	1010-755-4886	1 each

Enclosure Assembly, Forward

Brush, closure (11014542)	1010-756-5209	1 each
Enclosure, forward (11014543)	1010-756-3724	1 for each 2 subsystems

Chute Assembly, Ammunition Feed

Clamp (11014529)	5340-863-7178	1 each

5. Organizational Maintenance and Special Tools

Organizational maintenance was accomplished by the crew chief, door gunner, and aircraft armament repairman. Special tools currently authorized for organizational maintenance are sufficient. However, the ammunition loader required modification as it bound in the flexible chuting. The hand linker/delinker was seldom used since the round had to be removed to effect the linking or delinking. Unit personnel normally performed the connecting or disconnecting with a pair of needle-nose pliers in order to forego removal. The linker/delinker was required to reposition the links which were improperly placed during manufacture (long rounds).

6. Field Maintenance Equipment Required

Special test equipment and tools will be required by the proposed field maintenance detachment and by the interim field maintenance platoon. Annex D lists special equipment and tools for both the proposed detachment and interim platoon.

7. Ammunition Requirements

It was extremely difficult to determine an ammunition usage factor based upon day to day operation of the subsystem. Operations against the Viet Cong on occasion would not require the expenditure of M-5 ordnance for several days but then in a single operation of 24 to 36 hours duration, 500 to 1000 rounds of 40mm ammunition would be required. It was estimated that 150 rounds of 40mm ammunition were required per system per day.

8. Operational and Maintenance Procedures

a. Turret Cover

The M-5 subsystem was subjected to entry of blowing dust, dirt, sand,and water when the helicopter was parked on the ramp. The subsystem could absorb some foreign matter and still operate, but excessive dirt, and particularly sand, caused excessive wear and stopages. The turret should have been covered each time the system was not in use. As an interim measure a poncho was used for this purpose.

b. Inspection Before Firing

During the helicopter pre-flight, the copilot/gunner should inspect the turret to insure that the first round is positioned as indicated on the ammunition feed chute assembly, move the turret in elevation and azimuth to the design limits of travel, check the feed arm pivot pin for proper positioning, and inspect the hammer group for lubrication.

c. Ammunition Chute Cover

The rear ammunition chuting must be covered to prevent 7.62mm links, expended cartridge cases, and other foreign matter from entering. Cloth tape is used for a cover until a removable production cover is issued.

d. Ammunition Handling

Improper ammunition handling caused the majority of malfunctions during the evaluation. Operators had to take special care with M-5 ammunition as numerous long rounds and loose links were found in factory packed ammunition. The best procedure was to load directly from the ammunition packing container, inspecting for long rounds as the ammunition was pulled into the flexible chuting or ammunition box. Excessive handling of ammunition resulted from opening the wrong end of the ammunition packing container. This caused the operator to remove the entire contents from the container and place it on the ground before loading could commence. The simple procedure of opening the correct end of the packing container reduced stoppages by more than 50 percent. If ammunition was to be loaded directly into the chuting the top of the packing

container was opened, thus exposing the first round with its female connection which mates with the ammunition loader. Conversely, if ammunition was to be loaded into the ammunition storage box, the bottom of the packing case was opened, thus exposing the last round with its male connection.

9. Findings

The subsystem was reliable. Eighteen malfunctions were recorded, of which only seven were attributed to the subsystem itself. One deficiency and numerous shortcomings were found during the evaluation. The majority of malfunctions were a result of improper ammunition handling and ammunition quality control. Additional repair parts should be authorized at the unit level. Organizational maintenance procedures were adequate. The ammunition loader was inadequate and required modification. Additional tools and field maintenance test equipment were required to adequately support the armament subsystems in the RVN. Ammunition requirements were estimated to be 150 rounds per system per day.

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IV. (C) CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

It is concluded that:

1. The M-5 armament subsystem, when employed in areas other than dense jungle, is suitable for employment in a counterinsurgency environment and is capable of delivering a high volume of non-nuclear area fire in support of airmobile and ground maneuver operations.

2. When mounted on an armed helicopter, the M-5 subsystem, because of its short range, needs to be combined with another aircraft weapons subsystem possessing greater range capabilities.

3. The M-5, with its traverse capability and accuracy at short ranges, would provide close-in protection when mounted on troop transport helicopters entering and leaving landing zones.

4. Additional M-5 subsystems are required in airmobile companies in the RVN.

5. To allow a longer time on station, a greater ammunition capacity is required for the M-5 mounted on armed helicopters.

6. Improved ammunition quality control and an improved design of the ammunition loader is needed to improve overall reliability and reduce the M-5 reloading time.

7. The operational capabilities of the subsystem are degraded by using copilot/gunners who lack formal training and by the subsystem shortcomings as listed in annex C.

8. Organic aircraft armament personnel and ammunition handlers are necessary for adequate performance by the airmobile company.

9. Because of the heavy combat commitment of armed helicopter platoons in RVN, sufficient time is not available for copilot/gunner training at the organizational level. The lack of a formal M-5 training program in the RVN results in a temporary degradation in the operational capability of helicopter units and places a heavy training burden on the airmobile company.

10. An aircraft armament field maintenance capability is required within the aviation battalion area.

11. With the existing equipment, the best mix of weapons in the armed platoon is six helicopters with the M-6/2.75-inch FFAR and three helicopters with the combination XM-3/M-5 armament subsystem. It is less desirable with existing helicopters to combine the M-5 subsystem with the M-6/2.75-inch FFAR because the 7.62mm machinegun and the 40mm grenade launcher (M-5) have a similar range capability.

12. The M-5 shortcomings increase the training requirements, reduce accuracy, and increase the number of rounds required for target adjustment.

B. RECOMMENDATIONS

It is recommended that:

1. Each airmobile company in RVN be authorized six M-5 armament subsystems, three in the armed (UH-1B) platoon, one each in the two troop transport (UH-1D) platoons, and one backup subsystem.

2. The deficiency and shortcomings listed in annex C be corrected.

3. An M-5 copilot/gunner training course (in addition to CONUS training), with special emphasis upon range estimation, be established and conducted by US Army, Vietnam.

4. Three aircraft armament personnel and three ammunition handlers be organic to the airmobile company.

5. An aircraft armament field maintenance support detachment be located within the aviation battalion area. (See annex D.)

6. An aircraft armament field maintenance platoon be authorized in the RVN until such time as TOE detachments are available. (See annex D.)

7. Steps be initiated to improve ammunition quality control.

8. The B kit (aircraft) be modified to permit installation of the M-5 weapons subsystem on the UH-1D helicopter and that in the future the B kit be installed on all UH-1D helicopters at the factory.

(U) ANNEX A

AFTER-ACTION REPORTS

This annex contains short summaries of some operations flown with the M-5 armament subsystem. They are not complete studies but are intended to highlight certain activities during typical operations. The numbers plotted in figure A-1 correspond to the summaries described in this annex.

1. OPERATION ON 19 JUNE 1965

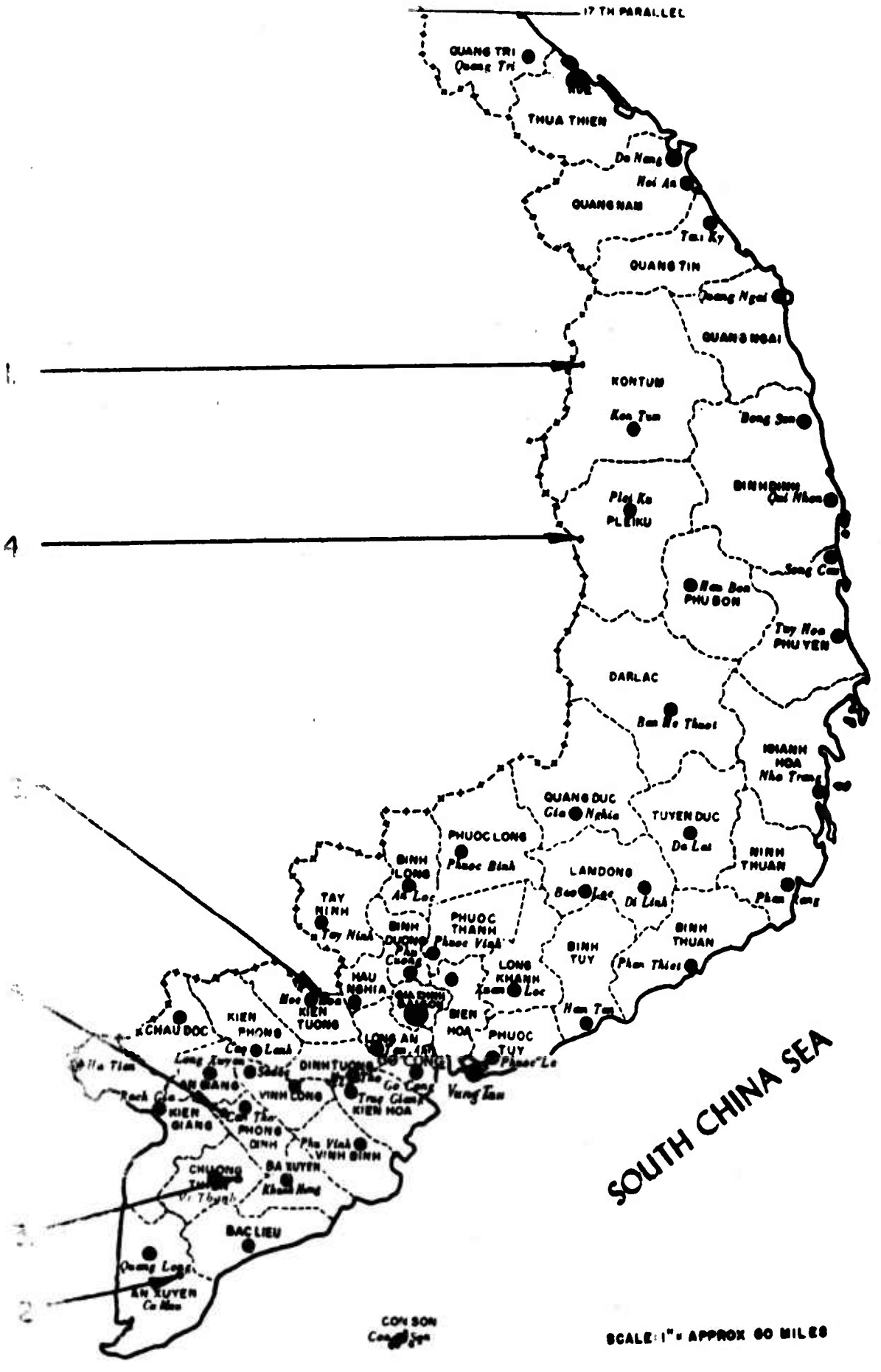
On 19 June 1965, the 119th Airmobile Company, Pleiku, airlifted 105mm ammunition from Tak To, coordinates ZB 049237, to Dak Sut, coordinates YB 925528. The airlift consisted of a light fire team, one M-6 (fire team leader), and one M-5, plus two troop transports. After takeoff from Tak To, the fire team leader reported a fuel leak and returned to the takeoff point. The other helicopters continued the mission but, because of weather conditions, flew at 1500 feet altitude.

The transports were in echelon right formation with the M-5 trailing 400 to 500 meters to the rear, 100 meters to the left, and approximately 150 feet below. About 7 minutes from Tak To, at the mouth of the Dak Sut Valley, coordinates YB 915350, the lead transport received heavy concentrated small arms automatic fire from an estimated six automatic weapons positioned to provide a crossfire. It appeared that the fire was not aimed at the lead helicopter but was so placed that the helicopters would fly through it. Also, it was noted that none of the enemy weapons were using tracers.

The general area was the scene of an ambush on 1 June 1965, in which flamethrowers were used by the VC in the attack, and was occupied by an estimated battalion plus two reconnaissance companies of hardcore VC.

The M-5 immediately returned the fire from an altitude of 1300 feet and advised the two transports to climb into the overcast. The copilot/gunner fired 150 rounds into the target area and no further fire was received.

When the two transports climbed into the overcast, the trail helicopter observed that the lead helicopter was on fire, whereupon the lead helicopter pilot began an emergency descent. The M-5 picked up the transport as it came out of the clouds and began to follow it in the descent. At approximately 300 feet, the tail boom came off the stricken ship and an explosion was observed. The helicopter then flipped over, crashed, and a second explosion was seen. The M-5 approached the burning helicopter to within approximately 100 feet and then climbed back to altitude. The M-5 and the remaining transport continued to Dak Sut, landed, and the crews made



(U) FIGURE A-1. Location of some operations during the evaluation.

an inspection of the helicopters. No damage was discovered. The fire team leader had monitored the conversation during the attack and left Tak To to rejoin the fire team. He flew over the attack area, observed the crashed helicopter, and did not receive enemy fire. At Dak Sut, the team leader joined the other helicopters and all returned to the target area.

An estimate of VC casualties could not be made because of the circumstances but since all enemy weapons had been silenced, sizeable personnel casualties must have resulted from the M-5 attack.

By this time, four F-100 and four A-1E aircraft had been diverted to the area and were making strikes. At about the same time, the remainder of the armed platoon from the 119th Airmobile Company arrived and joined the other helicopters. This group orbited, waiting until the fixed-wing airstrike was over, but they left the area without making a strike because of approaching darkness.

2. OPERATION ON 4 JULY 1965

On 4 July 1965, the 3rd Battalion, 33rd Regiment of the 21st ARVN Division was part of an overall operation when it was subjected to heavy intensive fire as it neared the objective area. An airstrike was requested and USAF planes attacked the objective area. The US advisor stated that the VC withdrew from the objective area during the airstrike, regrouped, and commenced a counterattack as his unit approached the objective. He called for armed helicopter support, marked his position, and requested the armed helicopters to strike 200 meters to his front. At the same time, for some unknown reason, ARVN dropped smoke grenades 150 meters to the rear of the US advisor's position.

The strike was made by an armed helicopter platoon including one M-5 subsystem. Guided by the smoke which was placed 150 meters to the rear, the armed ships struck 50 rather than 200 meters to the front of the friendly unit. The advisor likened the M-5 firing passes to an extremely heavy mortar attack and he observed parts of bodies and debris flying through the air. A body count was made and in the area of the M-5 attack some VC were still in foxholes and were observed with multiple small wounds in the head and shoulders. The body count revealed 212 total VC KIA and it was estimated that one-half of the casualties were from the armed helicopter attack, mostly from the M-5 40mm.

3. OPERATION ON 28 JULY 1965

On 28 July 1965 at approximately 0900 hours the armed platoon of Company A, 502d Aviation Battalion, 13th Avn Bn, was alerted for a contingency mission in support of an eagle operation being conducted in the Vi Thanh area (coordinates WR 518813) by elements of the 21st ARVN Divison.

At 1100 hours orders were received for the platoon to arrive by

1200 hours at the airstrip at Vi Thanh. Upon arrival at Vi Thanh, the platoon commander was briefed on the morning's developments, locations from which fire had been received, and friendly dispositions. He was instructed to proceed into the operational area and to contact the armed platoon commander and the commanding officer of the 121st Airmobile Company.

The armed platoon left Vi Thanh at approximately 1315 and flew to the operational area (coordinates AR 260670). Radio contact was made with the CO, 121st Airmobile Company shortly after takeoff and instructions were received to remain NE of the operational area since an airstrike was in progress. The armed platoon entered an orbit 7,000 meters northeast of the friendly positions. Radio traffic indicated that the advance of elements of the 21st Division was being held up by automatic weapons. The airstrike had been requested in order to permit continuation of the ground elements.

The copilot/gunner aboard the platoon commander's aircraft (equipped with the M-5) reported five VC in an open paddy area beneath the orbit, three in a semi-camouflaged hole and two hiding in waist-high grass. The M-5 gunner engaged the VC. One VC was killed by the first few rounds and the remainder ran. The CO, 121st Airmobile Company directed the armed platoon commander to contact the ground commander and provide suppressive fire on the automatic weapons positions. The platoon commander left one fire team to dispose of the remaining VC and, with his remaining fire team, proceeded to the operational area. The ARVN ground commander marked his position and directed the fire team (three armed helicopters) to a tree line and canal intersection to his left from which automatic weapons fire was being received. The three helicopters engaged the target, temporarily neutralizing it. At this point the platoon was directed to Vi Thanh, for reloading and refueling.

In midafternoon, the 3rd Bn, 33rd Inf, 21st Division was air landed about 3,000 meters south of the operational area to block the VC's withdrawal. By nightfall the unit had advanced only 400 to 600 meters against stiff resistance.

Back in the operational area, the platoon was assigned a screening mission, covering the flanks, while airstrikes continued on the objective. The screening mission continued for the next 4 hours, during which approximately 25 VC infiltrators were killed attempting to leave the area. In addition, one occupied bunker and one large rice-laden sampan were destroyed with M-5 rounds.

Airstrikes on the objective area included USAF and Navy jets and Al-E's dropping bombs and napalm and strafing with 20mm cannon. The daylight airstrikes continued until approximately 1930 hours. A night airstrike about 2000 hours was made using napalm followed by a 20mm strafing run.

Immediately following the last daylight airstrike, the ground commander requested the armed platoon to attack, placing emphasis on areas immediately to his front from which fire was still being received. The platoon expended all ammunition (40mm, 7.62mm and 2.75-inch FFAR) with good effectiveness as the ground element continued its advance.

Following the strike, the ground commander requested a resupply mission. The platoon commander escorted one transport with a load of ordnance on board into the position. The plan was for the transport to remove a load of wounded, but he had barely touched down when two mortar rounds dropped close by. The pilot loaded some of the wounded and made a hasty takeoff.

At 2030 hours, resupply was requested by the airlanded force. The resupply transport was guided into the LZ by a pair of flashlights barely 500 meters from an area of intense automatic weapons fire. The platoon commander, escorting the transport, made repeated rocket and M-5 passes on the enemy positions. During the 6 to 7 minutes the transport was unloading ammunition and receiving wounded, all VC weapons were focused on the platoon commander's helicopter, but his external helicopter lights were extinguished thus presenting a difficult target to the VC.

The platoon rearmed, refueled, and returned to the operational area about 2130 hours to strike three pre-selected target areas. Each fire team struck a separate target and the M-5 attacked the third target area. This area was the closest to the airlanded force, which was in a position to observe the strike at close range. The platoon expended 212 rounds of M-5 and 24 rockets into an area 200 by 200 meters. The ground commander was extremely pleased with the performance of the armed platoon.

On the morning of 29 July an inspection was made of the 200 by 200 meter area which had contained bunkers and firing positions. The area was badly damaged and nearly defoliated. A body count revealed 54 VC KIA outside of the ARVN night perimeter. The VC had withdrawn during the night, taking most of their dead and wounded, but it was estimated that the total VC losses were 190.

4. OPERATION ON 8 AND 9 AUGUST 1965

On 8 August 1965, a combined Marine/Ranger Vietnamese unit of approximately 1300 men was moving from the Pleiku area toward Duc Co (Chudron) (coordinates YA 810235) by vehicular convoy. Approximately 5000 meters from Duc Co, the convoy was ambushed and split into three segments. Some 26 VN troops were killed and 60 wounded. The friendly troops established a defense for each of the three segments.

On the afternoon of 9 August, an element of the 119th Airmobile

Company evacuated dead and wounded. The enemy situation was vague but the American advisor reported that friendly troops had secured the ground out to 1500 meters from the intended landing zone. Two transports proceeded into the LZ with three armed helicopters providing cover. Initially, suppressive fire was not used because of the reported proximity of friendly troops. However, the forward air controller (FAC) asked for the gun ships to strike a village north of the LZ as soon as the medical evacuation ships were clear. During the approach to the LZ, the armed platoon commander noticed one small group of troops setting up a machinegun about 150 meters from the LZ. Although concerned about this apparent hostile act, the platoon commander could take no immediate action because these troops were within the area reported as secure. As soon as the transports landed, they reported being fired upon from a woodline approximately 100 meters from the LZ, or from about the same area where the armed platoon commander had seen the machinegun crew. The armed helicopters immediately took this area under fire with 40mm, rockets, and machineguns. The armed helicopters received several hits but were successful in suppressing the enemy fire so the transports could continue evacuating the dead and wounded.

As soon as the transports were clear, the FAC identified a village where an estimated VC battalion was located. The armed helicopters engaged the target with the remaining 40mm, rockets, and machinegun ammunition, destroying much of the village. After expending all of their ammunition, the armed helicopters returned to Pleiku airfield.

5. OPERATION ON 27 AUGUST 1965

On 27 August 1965, elements of the 21st ARVN Division plus the 44th Ranger Battalion were conducting a search and destroy operation along two principal canals leading south-southwest (XS 750040) approximately 60 kilometers northwest of Soc Trang. The ground elements were supported by Company A, 101st Aviation Battalion from Soc Trang and the 114th Airmobile Company from Vinh Long (13th Aviation Battalion).

Two ARVN companies were airlifted 8 miles to the southwest to act as a blocking force while two ARVN companies proceeded south-southwest along the canals. Initially, only light contact was made, but after 2 hours, the armed platoon of Company A discovered a battalion of VC along a canal in the vicinity of WR 6291. The armed platoon engaged the VC while an Air Force strike was being made on a selected landing zone 300 meters to the west of WR 6291. Three ARVN companies landed in this LZ and were immediately pinned down by heavy VC machinegun fire.

The armed platoon of the 114th Airmobile Company relieved Company A and the engagement of the VC battalion continued. The engagement was conducted primarily by armed helicopters and Air Force fighters as the ARVN troops were still receiving VC fire. The H-5 helicopter was hit by VC ground fire and forced down. After repair of a fuel leak, the

M-5 helicopter returned to the attack. Several hits were taken and the ship again was forced down. After inspection, the helicopter was evacuated to Vinh Long.

The armed platoon of Company A again came on station and continued to engage the VC battalion. By this time, it was apparent that the VC unit was hardcore, well-trained and were employing a variety of automatic weapons. As the operation continued both M-5 helicopters received hits from VC groundfire and were rendered inoperative. In both cases, the helicopter electrical wiring harness which connects the M-5 to the helicopter electric system had been severed. The helicopters were returned to Soc Trang and ultimately to Vung Tau for repair of the wiring harness.

During the operation, US advisors selected targets for the armed helicopters and on several occasions specifically requested the M-5. Each time the advisors reported excellent results from the M-5 strikes. A total of 1130 rounds of M-5 ammunition was fired by three subsystems during the operation.

6. OPERATION ON 3 AND 4 SEPTEMBER 1965

On 3 September 1965, elements of the 9th ARVN Division, a reconnaissance force, and the 25th River Assault Group (RAG) conducted an operation to isolate and destroy a VC battalion located in the vicinity of coordinates XS 1296 northeast of Moc Hoa. These ground elements were supported by one artillery section, the 114th, 121st, and 101st Aviation Companies of the 13th Aviation Battalion, plus USAF and VNAF strike aircraft.

One infantry battalion plus the attached reconnaissance element began the operation by advancing from the north and northwest while one battalion was placed in a blocking position on the southeast. The RAG covered the river on the south and southwest. In the early stages of the operation there was only sporadic contact established when a few VC and some enemy weapons were captured. At about 1500 hours, the VC realized that ARVN forces had completely encircled them, and they began to fight from significant positions within the objective area. The VC primarily fought from the tree lines but many were entrenched in the middle of rice paddies and were either by passed or became intermingled with ARVN forces. The VC made a determined effort to hold their positions with small arms, machineguns and mortars. They were able to retain these positions in several areas despite repeated pounding by USAF and VNAF strike aircraft and concentrated attacks by armed helicopters. The tactical commander reinforced his ground units with reserve airmobile forces and used other airmobile forces to block possible avenues of withdrawal. Unfortunately, due to the stubborn determination of the VC, the main enemy positions were not breeched prior to nightfall. At this time the ARVN established perimeter defenses and the VC escaped during the night.

The M-5 was used throughout the operation in suppressive and area fire roles. On three occasions the results of M-5 employment could be partially evaluated, but it must be remembered that the subsystem was employed in conjunction with 2.75-inch rockets and 7.62mm machineguns. On the first occasion the advance of one ARVN company was completely stopped by enemy small arms and machinegun fire from a tree line in the objective area but fire from the M-5 and other weapons silenced the machinegun and many of the small arms. The results were sufficient to allow the ground unit to resume its advance but it was stopped again by automatic weapons fire after convering only a short distance. On the second occasion, several VC were observed running toward the river line. The M-5 was the principal weapon employed here and, although VC casualties could not be observed, there was no further movement and no fire was received from the area even though at times the armed aircraft were directly overhead. On the third occasion, one unit received heavy mortar fire and was sustaining casualties. The armed helicopters determined the location of the mortar and once again the M-5 was mainly responsible for silencing the VC weapon.

The 9th ARVN Division plus attachments continued the operation beginning at about 0800 hours 4 September but met no enemy resistance. During the entire operation 60 VC were killed and 30 were captured. Prisoners interrogated had no comments on the effects of the M-5. Also, advisors of leading elements could not specifically identify the effects of the M-5 and investigation of one target area was non-productive. Therefore it could not be determined which effects were attributable to the M-5 and which to other helicopter and Air Force armament systems. However, it is felt that any Army aircraft weapon would have very little effect on the type of positions occupied by the VC (deep foxholes with overhead cover and firing apertures). The greatest value of the M-5 system against this type of target was to keep the enemies' heads down while the ground forces conducted the assault.

(U) ANNEX B

SETTING OF THE EVALUATION

1. ENVIRONMENT

The Republic of Vietnam (RVN) occupies a crescent-shaped area of about 67,000 square miles on the southeastern edge of the Indochina Penninsula. Although only 45 miles wide at the 17th parallel, its demilitarized northern border with the Democratic Republic of Vietnam (North Vietnam), it has a seacoast of 1,500 miles on the South China Sea and Gulf of Siam, and western borders with Laos and Cambodia of about 900 miles. The land borders are poorly defined and drawn through difficult and inaccesible terrain.

a. Terrain

There are four distinct geographical regions: The highlands located in the north and central portion, the plateau of the central highlands, the coastal plain, and the Mekong Delta in the south. See figure B-1.

The northern two-thirds of the RVN is dominated by a chain of broken mountains and rugged hills extending in a northwest-southeast direction and terminating on the northern edge of the delta plain about 50 miles north of Saigon, the capital. The area is characterized by steep slopes, sharp crests, narrow valleys, and dense vegetation. It is sparsely populated, mainly by primitive and nomadic tribes, and it contains few roads or trails.

The central highlands adjacent to the Laos-Cambodia border contain extensive plateau areas. Here, the mountains give way to more gently rolling terrain. The northern plateau is covered by almost impentetrable tropical forests and jungles, which often have two dense overhead layers of foliage at heights of about 40 and 125 feet. The southern portion is typical savannah country, with large open expanses covered by tropical grasses and open forests. This region is more heavily populated than the northern highlands and has more roads and trails.

The coastal plain, varying from 10 to 25 miles in width, extends from the 17th parallel to the Mekong Delta. At several places mountain spurs jut out to the sea, cutting the plain into a series of compartments roughly at Mui Dinh, Mui Ke Ga, Quang Ngai, Da Nang, and Hue, north of which the spurs become more frequent. The area is characterized by sandy beaches and dunes, backed up by rice fields, fertile areas, and marshes extending to the mountains. It contains many small cities.

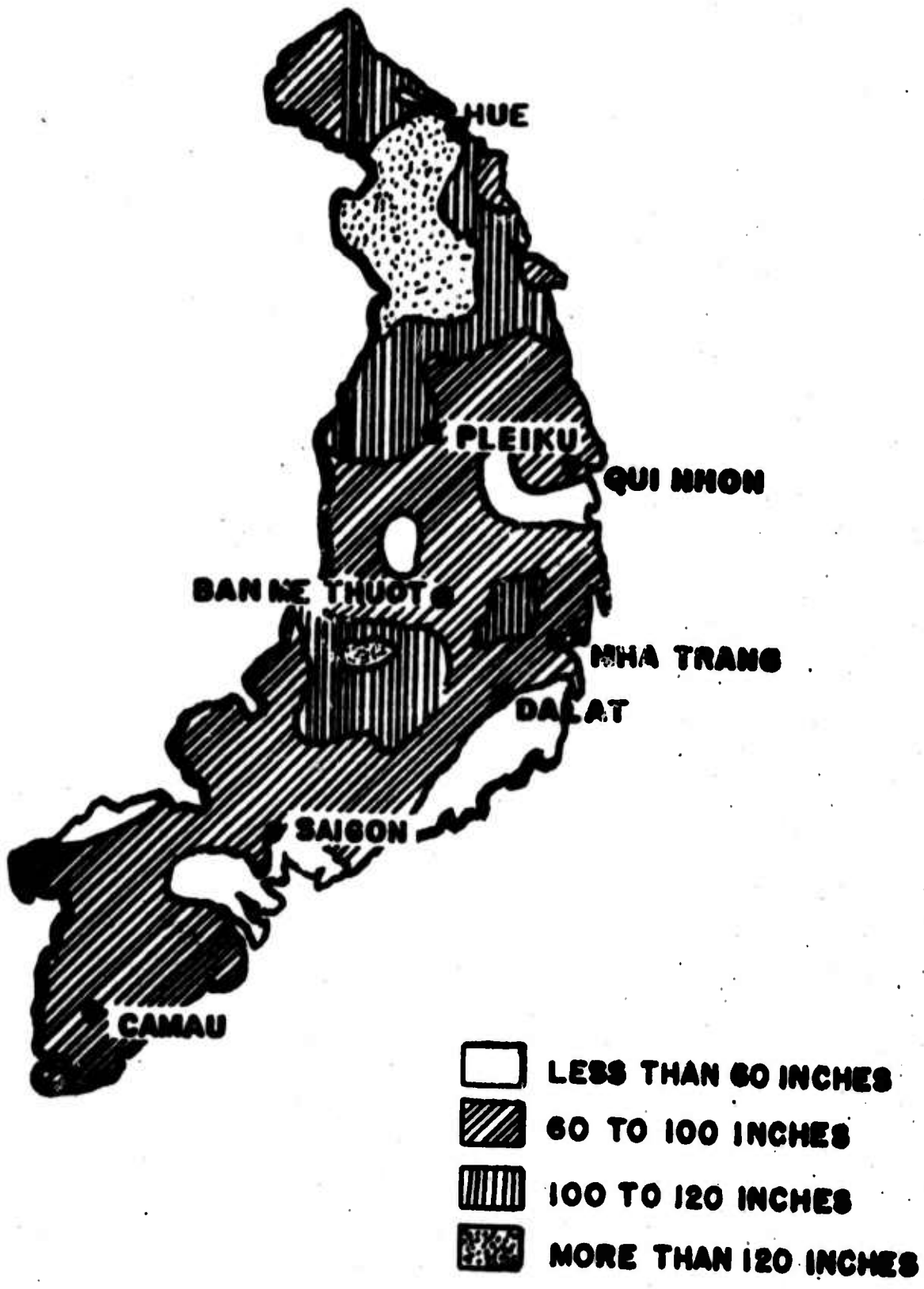
(U) FIGURE B-1. Geographical regions, MVN.

The southern third of the country is part of the large delta plain formed by the rivers Hau Giang, Mekong, Vam Co, Saigon, and Dong Nai. The Hau Giang flows directly to the South China Sea. The huge Mekong splits into four branches and the Vam Co and Dong Nai enter the Saigon before reaching the sea. In addition to these major tributaries, the area is cut by a number of smaller streams and a dense network of canals. The plain is relatively flat with few points exceeding an elevation of 20 feet above sea level. It is a very fertile area with more than 9,000 square miles under rice cultivation. Drainage is effected chiefly by tidal action, with the difference between ebb and flood as much as ten feet in some areas. The southernmost tip of the delta, known as the Ca Mau Peninsula, is covered with dense jungles, and mangrove swamps stand at the shoreline and on river estuaries. The eastern portion of the delta plain is heavily forested. The Plain of Reeds, a large marshy area covered with tall reeds and scrub trees, is located in the center of the delta region adjacent to the Cambodian border. During the rainy season, a major portion of the entire area is completely inundated.

b. Climate and Weather

The climate is hot and humid, subtropical in the north and tropical in the south where the monthly mean temperature is about 80 degrees Fahrenheit. The annual rainfall is heavy in most regions and torrential in many. It is heaviest at Hue which has as annual average of 128 inches. The low of 28 inches at Mui Dinh, a small cape on the eastern coast some 62 miles south of Nha Trang, results from the presence of hills in the area. At Saigon, rainfall averages 80 inches annually. See figure B-2.

Seasonal alternation of monsoon winds profoundly influences the weather throughout the year, although geographical features alter patterns locally. The winter monsoon blows generally from the northeast from early November to mid-March and often brings floods to the northern portion of the RVN. This is the period of the dry season in the delta, which usually lasts from December through March. The winds begin to shift in March, and with the exception of the coastal plain, high temperature and humidity prevail in all of the RVN from April to mid-June. The summer monsoon blows generally from the southwest from mid-June to late August or early September, bringing to the delta region heavy and frequent rains, high humidity, tropical temperatures, and maximum cloudiness. Mountains cause clouds to pile up and deposit moisture before the clouds reach the coastal plain or the northern highlands, which areas are dry during this period. In September the winds begin to shift again, and the coastal plain receives its maximum amount of rain and cloud cover, including severe tropical storms and typhoons.



(U) FIGURE B-2. Annual precipitation, RVN.

c. Communications

Roads throughout the RVN are few in number, poorly cared for, and narrow. Road travel to major areas in the north is often stopped completely when bridges and narrow places are destroyed, either by natural causes or the Viet Cong (VC). In the delta region, 2,500 miles of navigable inland waterways ease somewhat the communication burden placed on the 1,200 miles of primary and secondary roads in the region.

A single-track, narrow gauge railroad connects Saigon with the northern provinces by way of the coastal plain. The system and equipment is old and frequently damaged by the VC.

There is no wire telephone communication among the major centers of population. What radio telephone service is available is at the mercy of the often unstable atmospheric conditions over the RVN. Telephone equipment used in major cities is antiquated or makeshift.

In effect, rural areas are virtually isolated. It is not unusual for a VC act of terrorism or sabotage to take place in an outlying delta area and be reported in Saigon a week or more later. Most incidents accounted for take at least two or three days to get into the situation reports to Saigon.

d. Population

The RVN has a population of approximately 15.7 million, with an average density of 234 per square mile. The highland region is generally the least settled of the geographic areas of the RVN, and the coastal plain contains the most people. About 90 percent of the people live on the 13 percent of the land best suited for rice cultivation: the delta and the small river basins of the coastal plain.

Racially, the population is composed of 85 percent ethnic Vietnamese, 6 percent Chinese (who have established a great influence on the economy of the RVN), 5 percent Montagnard (the nomadic aboriginal tribe people living in the highlands), 3 percent Khmer-Cham (of Cambodian descent), and 1 percent European, Indian, and other small groups.

Religiously, about 80 percent profess Buddhism, about 10 percent profess Catholicism, and the rest profess Muhammedanism, Hinduism, Protestantism, Cao Daism, or Hoa Haoism (two local sects).

Socially, there is an upper class composed of old mandarin families, landed gentry, government officials, professional men, intellectuals, clergy, and wealthy businessmen; an urban middle class of civil servants, teachers, and small businessmen; and a lower class, mainly composed of farmers, but with a growing group of urban workers. Mobility upward within the structure is possible but difficult, especially up from the lowest.

Vietnamese culture is based on traditional Chinese customs and has been profoundly influenced, especially among the upper class living in the cities, by the French. Most rural Vietnamese continue to follow the traditional way of life. The great divergence in racial, religious, social, and cultural structures has produced continued strife and tension among the people who belong to the various groups. There seems to be no evidence of a permanent stabilizing force available within the Vietnamese society to control conflicting elements.

The Vietnamese have a deep and traditional belief in destiny and man's inability to change the natural order of events. This concept, reinforced by religious beliefs, results in a high valuation of the virtues of stoicism, patience, and endurance. The Vietnamese are proud of their ethnic traditions and hold themselves superior to ethnic minorities in the RVN and to the peoples of neighboring countries.

Most of the people living in the countryside, who make up 90 percent of the population and who provide the main targets for the VC, care neither for the government in Saigon nor for the VC. They want to be left alone to grow their crops, raise their families, have a tranquil old age, and die traditionally.

2. MILITARY ELEMENTS

a. Friendly

Airmobile companies providing armed helicopters and air crews for the evaluation of the M-5 40mm Grenade Launcher were selected primarily for their area of operation in the II and IV ARVN Corps areas. This provided a representative cross section of all types of terrain and weather found in the RVN.

(1) Units

13th Aviation Battalion

Company A, 101st Aviation Battalion
Company A, 502d Aviation Battalion
114th Aviation Company
121st Aviation Company

52d Aviation Battalion

Company A, 1st Aviation Battalion
117th Aviation Company
119th Aviation Company

(2) Missions

The 13th Aviation Battalion provided troop transport and armed helicopter support for the IV ARVN Corps.

The 52d Aviation Battalion provided troop transport and armed helicopter support for the II ARVN Corps.

b. Enemy

It is a well-documented fact that the Communist apparatus in the RVN is an extension of the Communist party of North Vietnam, and that direction and materiel and personnel support is received from the North. Supreme authority in the VC political and military organization in the RVN is the Central Office South Vietnam located in Tay Ninh Province near the Cambodian border. Subordinate thereto are four military regions and one special zone (corresponding roughly to the capital area), each of which has a subordinate series of provincial, district, and village-commune party committees.

(1) Units

The VC military forces can be divided into 3 operational categories: main force, local force (together about 35,000 troops), and militia units (60,000 to 80,000 soldiers). The main force consists of full-time units controlled by the military region. Local force units are controlled by province and district committees. They are well-organized, and the personnel are well-trained and well-equipped. Militia units are full- and part-time local armed groups responsible to district, village, and hamlet authorities. Personnel of these units are used frequently as intelligence gatherers, porters, or as reinforcements for main and local force units. They may replace losses in the local force.

A VC battalion is planned for 400 to 500 men, but in reality may consist of as few as 250. A company averages 100 men, and a platoon about 30. Personnel may be acquired voluntarily, by kidnapping, or by impressment using blackmail or threats of violence. There is evidence that large numbers (a total of about 45,000 in four years since 1960) of native-born North Vietnamese have infiltrated from North Vietnam through Laos into the RVN.

Viet Cong forces are in general lightly equipped and have a commensurate degree of cross-country mobility. In addition to individual weapons, they have a large number of automatic weapons and light crew-served weapons. The larger units are equipped with mortars and recoilless rifles. Supplies are obtained through capture, local procurement, taxation, and infiltration. Food staples such as fish, rice, and manioc are readily available.

(2) Capabilities

Because of support rendered by the country people, familiarity with the area, lack of responsibility for life and property, and the nature of guerrilla organization, equipment, and tactics, the VC are able to move virtually at will throughout much of the RVN. They are able to exploit as necessary the differences in race, religion, class, economic condition, and cultural background of their targets. They have a well-developed intelligence system, good discipline, and a usually effective security system.

Viet Cong military operations have the advantages of speed, surprise, deception, and infiltration. Training, accomplished in small, local areas by well-indoctrinated cadre, probably emphasizes selection of the most vulnerable targets, night operations, movement as small units until concentration is required, terrorism and propaganda, use of weapons, employment of terrain and weather, and infiltration. The VC objective is not, at the present stage of their insurgency to hold terrain, but rather to inflict losses on government forces, to capture weapons and materiel, and to convince the people that the government in Saigon cannot protect them and will eventually be defeated.

(3) Limitations

Viet Cong limitations stem from their need for strong security and the largely clandestine nature of their activities. Although the people among whom they live afford them a high degree of protection, active and passive, force must often be used, and support based on threats and fear endures only as long as pressure is brought to bear. Primitive living conditions add to the strain of avoiding government troops until the right moment. The VC are vulnerable to air and artillery attack, and less so to armor attack. Limited logistical capability, lack of communications, and insufficient medicine are other weaknesses.

(C) ANNEX C

EQUIPMENT FAULTS

1. DEFICIENCY

Deficiency	Suggested Corrective Action	Remarks
An electrical short in the wiring harness of the B kit (aircraft) caused inadvertent firing of the subsystem.	Redesign the cannon plug or the turret control panel connector.	As an interim repair, the cannon plug was disconnected from the A4J3 connector (1010-756-5190) of the turret control panel.

2. SHORTCOMINGS

Shortcoming	Suggested Corrective Action	Remarks
a. The lack of a tracer/marking round contributed to the inability of the copilot/gunner to place accurate fire on the target.	Develop a tracer/marking round ballistically matched to the M-384 round.	None
b. The muzzle velocity of the projectile was too low.	Increase the muzzle velocity of the projectile.	None
c. The ammunition capacity was inadequate when the M-5 was mounted on armed helicopters.	Procure a larger capacity ammunition box.	The 150-round capacity would be adequate for transport helicopters.
d. 40mm HE ammunition (M-384) was received with long rounds, loose links and loose warheads (ogive).	Improve ammunition quality control.	None
e. Handling tool, ammunition loader (modified) FSN 1010-757-9973) was too flexible and frequently stuck in the ammunition chute assembly.	Improve the design of the loader.	Required to reduce the reloading time.

Shortcoming	Suggested Corrective Action	Remarks
f. The sight reticle had a limited number of range graduations and lacked deflection graduations.	Redesign the sight.	A more accurate sight would greatly increase the operational capabilities of the subsystem.
g. Weapon feedback (recoil) was transferred from the gun through the airframe and sight mount to the copilot/gunner.	Improve the sight mounting.	Because of the lack of recoil, the first round was apt to be more accurate than the following rounds.
h. The lack of sufficient height adjustment of the sighting station rapidly induced copilot/gunner fatigue.	Same as f above.	None
i. The lack of a cover for the rear ammunition chute assembly allowed extraneous material to enter the chuting.	Procure an easily removable canvas cover.	Links and expended cartridges from the door gunners machineguns caused stoppages.
j. The brush, closure (FSN 1010-756-5209) became "set" in the open position allowing foreign matter to enter the turret.	Manufacture the closure brush from a different material.	None
k. The enclosure, forward (FSN 1010-756-3724) could be installed incorrectly with the flanges outside the rear cover.	Improve the design of the enclosure.	None
l. The panel fastener assembly (FSN 1010-756-5208) was subject to frequent breakage.	Manufacture a stronger and more durable item.	None

Shortcoming	Suggested Corrective Action	Remarks
m. The machine screws (10 x 3/8, 88044 - 507 - 1032 - 6) worked loose and became disconnected from the forward enclosure.	Manufacture a more durable item and improve the design for connecting to the enclosure.	None
n. The clamp (FSN 5340-863-7178) which held the cable assembly to the ammunition feed chute assembly was subject to frequent breakage.	Manufacture a more durable clamp.	None
o. The fastener which coupled the end fitting, exit, flexible chuting (FSN 1010-756-5240) to the chute assembly, ammunition feed (FSN 1010-756-3753) was difficult to open and close.	Redesign the fastener.	Fastener should be easily opened or closed with one hand.
p. The pin assembly, quick release (FSN 1010-755-4886) was difficult to remove.	Redesign the pin assembly in a T-bar configuration.	The turret must be held with one hand and the pin removed with the other. This action required depressing the pin plunger and at the same instant pulling on the pin ring.
q. Attachment and detachment of the front ammunition chute assembly to the ammunition booster assembly was extremely difficult.	Enlarge the electronic compartment access port.	None
r. Access to the ammunition booster, turret electrical cable connection, and feed control switch in the electronic compartment was restricted.	Same as q above.	None

Shortcoming	Suggested Corrective Action	Remarks
s. The cartridge positioner could be installed incorrectly.	Improve the design of the item.	None
t. The cover assembly, ammunition box, (FSN 1010-755-9915) was extremely difficult to open and close.	Improve the design of the fasteners.	None
u. The lack of a gun muzzle cover allowed dust, dirt, water, and mud to enter the receiver, both when the helicopter was parked and during hover prior to operating.	Procure an expendable muzzle cover.	The cover should remain in position until the first round is fired and removal should be by round penetration or action.
v. The lack of a protective turret cover allowed water, dust, and dirt to enter the turret while the helicopter was parked.	Procure a suitable protective cover.	The cover is a necessity during the RVN dry season and also for operation in dusty areas and desert-type terrain.
w. Helicopter instruments vibrate excessively during firing at the limits of turret travel.	Dampen recoil forces of the subsystem.	Instruments are unreadable when the subsystem is fired at extreme angles of traverse and depression/ elevation.
x. Electrical limit switch actuator improperly set at the factory.	Improve quality control on this item.	None

3. CORRECTED SHORTCOMINGS

Shortcoming	Corrective Action	Remarks
a. Slow gun traverse rate.	The 115 volt ac lead for the M-5 was connected to an A-phase terminal instead of a C-phase terminal.	The 115 volt ac lead was connected to the C-phase terminal.

Shortcoming	Corrective Action	Remarks
b. The turret drifted in azimuth and elevation because of a loose gear on the control synchro assembly.	The gear was secured to the shaft by using a cement-like material (trade name LOC-TITE).	None
c. Failure to feed caused by M-60 machine-gun links and expended cartridges falling into the rear ammunition chuting.	Tape used to cover the chuting.	Interim repair.

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(U) ANNEX D

PROPOSED ORGANIZATION AND EQUIPMENT

1. TOE AIRCRAFT ARMAMENT FIELD MAINTENANCE DETACHMENT (DS)

Number	Title	Grade	MOS
1	Aircraft Armament Officer	W03	421A
1	Aircraft Armament Supervisor	E7	45J40
1	Clerk/Typist	E4	71B20
1	Ordnance Supply Specialist	E4	76D20
3	Senior Aircraft Armament Repairmen	E6	45J20
1	Senior Small Arms Repairman	E5	45B20
1	Small Arms Repairman	E4	45B20
9	Aircraft Armament Repairmen	E4	45J20

Total: 1 warrant officer, 4 non-comissioned officers, 13 enlisted men.

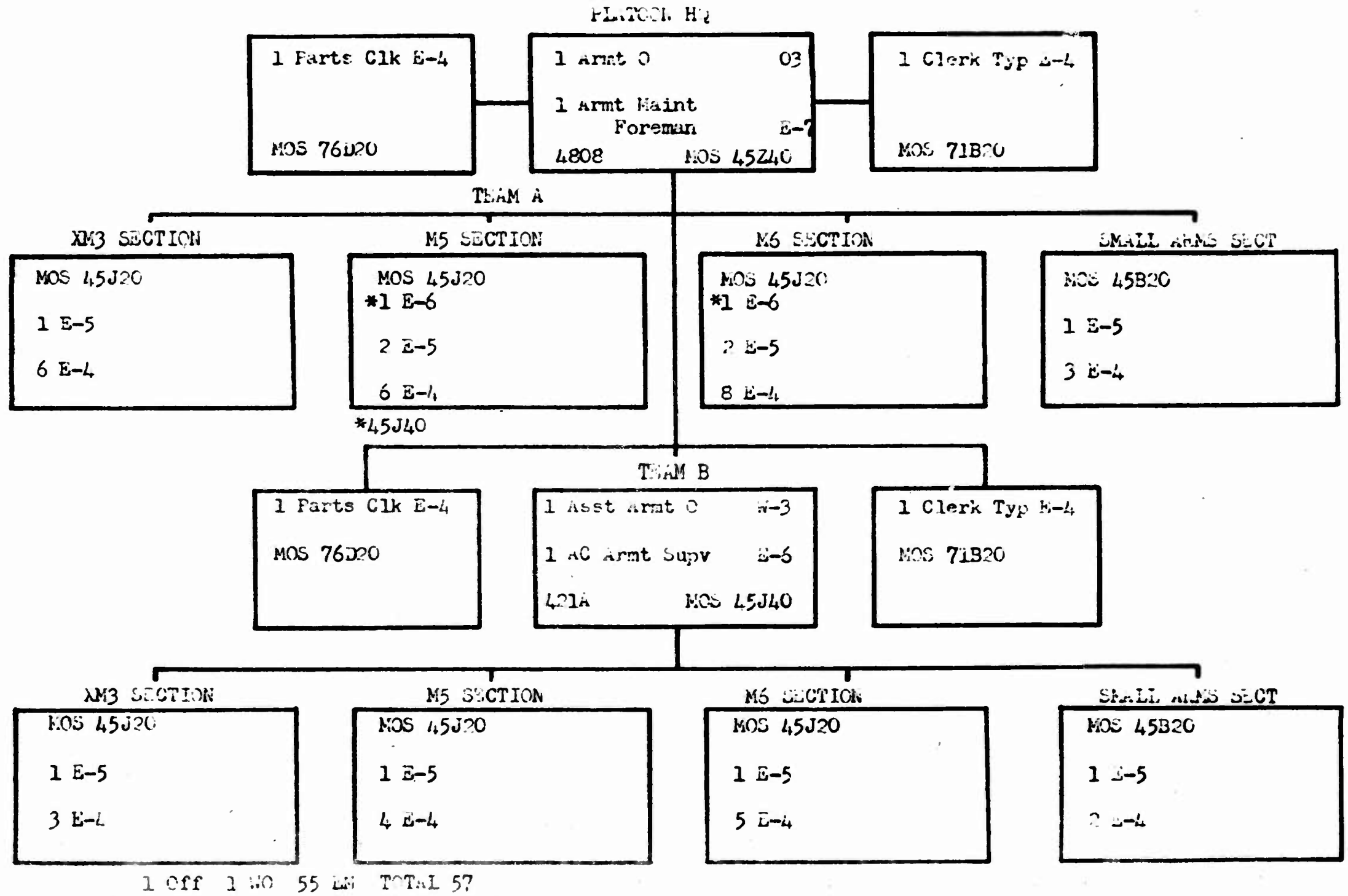
2. SPECIAL EQUIPMENT AND TOOLS FOR AIRCRAFT ARMAMENT FIELD MAINTENANCE DETACHMENT (DS)

Nomenclature	FSN	Number Required
Compressor, air 15 CFM 3600 PSI	4310-679-6917	1 ea
Floodlight set, portable, electric mast mounted	6230-299-7072	1 ea
Generator set, DD 15 KW	6115-653-5634	1 ea
Generator set, gas engine, AC 60 cycle 1.5 KW skid mounted	6115-778-6004	1 ea
Tool kit, field maint quad helicopter armament subsystem	4933-773-2100	2 ea

Nomenclature	FSN	Number Required
Test set, armament sub-system. 7.62mm machine-gun	4933-056-0202	1 ea
Test set, armament sub-system, helicopter 40mm grenade launcher M-5	4933-778-0926	1 ea
Tool set, aircraft armament, repairman MOS 427 basic	4933-987-9816 SM 9-4-4933-A15 8 Mar 63	12 ea
Tool set, aircraft armament repairman, MOS 427, supplemental	4933-994-9242 SM 9-4-4933-A16 8 Jul 63	4 ea
Power cart, hydraulic and electric, 220 volt, 50-60 cycle, 1500 PSI (Sun Electric)	UNKNOWN	1 ea

INTERIM

3. AIRCRAFT ARMAMENT FIELD MAINTENANCE PLATOON (DS)



1 Off 1 WO 55 EM TOTAL 57

4. SPECIAL EQUIPMENT AND TOOLS FOR AIRCRAFT ARMAMENT FIELD MAINTENANCE PLATOON (DS)

Nomenclature	FSN	Number Required
Compressor, air 15 CFM 3600 PSI	4310-679-6917	1 ea
Floodlight set, portable, electric mast mounted	6230-299-7072	1 ea
Generator set, DD 15 KW	6115-653-5634	1 ea
Generator set, gas engine AC 60 cycle 1.5 KW skid mounted	6115-778-6004	1 ea
Tool kit, field maint, quad helicopter armament subsystem	4933-773-2100	2 ea
Test set, armament subsystem 7.62mm machinegun	4933-056-0202	1 ea
Test set, armament subsystem helicopter 40mm grenade launcher M-5	4933-788-0926	1 ea
Tool set, aircraft armament, repairman MOS 427 basic	4933-987-9616 SM 9-4-4933-A15 8 Mar 63	42 ea
Tool set, aircraft armament, repairman MOS 427 supplemental	4933-994-9242 SM 9-4-4933-A16 8 Jul 63	12 ea
Power cart, hydraulic and electric, 220 volt 50-60 cycle 1500 PSI (Sun Electric)	UNKNOWN	1 ea

(U) ANNEX E

EVALUATOR CHECKLIST

This annex contains a sample copy of the detailed data collection form (Evaluator Checklist) used during the evaluation.

M-5 40MM ARMAMENT SUBSYSTEM

EVALUATOR CHECK LIST

GENERAL INFORMATION

1. Date _____

2. Mission No _____

3. Area of Operation (Geographical Name) _____

4. Coordinates: _____

_____

5. Altitude (Above Sea Level) of Area _____

6. Type Area: Highlands/Plateau-Coastal Plain/Central Lowlands - Delta Plains

7. Weather _____

_____

_____

_____

8. Enemy Situation _____

_____

_____

_____

9. Briefing Conducted _____

_____
(DTG)

A. Aircraft No _____

B. Unit _____
Co and Bn Designation

C. Crew

(1) _____
Aircraft Commander

(2) _____
Copilot/Gunner

(3) _____
Crew chief/Armorer

(4) _____
Door Gunner

D. Evaluator - Check as appropriate

(1) Eval was M-5 Gunner _____

(2) Eval was obser M-5 A/C _____

(3) Eval was gunner on _____ ___

(4) Eval was obser in _____ ___

E. Other Personnel Contacted

Grade	Name	Unit

NOTE: Answer all questions Part I thru Part IV and then write a summary of the mission (Part V).

PART I

EMPLOYMENT TECHNIQUES

Objective: Document the technique of employment of the M-5 armament subsystem in a counterinsurgency environment.

1. What were the techniques of employment of the M-5 armament subsystem?

a. The technique of employment described or diagrammed in this part was for what mission? (Check as appropriate)

Visual Reconnaissance..... ___

Support of Airmobile Assault..... ___

Support of Eagle Assault..... ___

Overhead Cover for Ground Operations.. ___

Escort of Unarmed Aircraft..... ___

Convoy Escort..... ___

Emergency Reaction Force..... ___

Other:_____

_____

_____

_____

b. The technique of employment was for what size fire element?

Light Fire Team... ___

Heavy Fire Team... ___

Platoon Minus..... ___

Armed Platoon..... ___

Other:_____

_____

_____

c. What formation(s) was used during each mission? (Diagram acceptable)

Type mission _____

Type mission _____

Type mission _____

d. What was the maximum range that the firing pass was initiated? _____ M _____ M _____ M _____ M

e. At what range was the firing pass terminated? _____ M _____ M _____ M _____ M

f. What was the average number of rounds expended on a firing pass? _____ rounds.

g. The firing pass was initiated at _____ Ft and _____ K _____ Ft and _____ K _____ Ft and _____ K _____ Ft and _____ K

h. The firing pass was terminated at _____ Ft and _____ K _____ Ft and _____ K _____ Ft and _____ K _____ Ft and _____ K

i. In what direction was the break normally made? Right ____, Left ____.

j. Which direction of break was considered advantageous over the other? Right ____, Left ____. Explain-_____

_____

_____.

k. Did the disposition of friendly troops influence the technique of employment? Yes ____, No ____. Explain-_____

_____

_____.

l. Did the terrain influence the technique of employment? Yes ____, No ____. Explain-_____

_____

_____.

m. Did the direction and velocity of the wind influence the technique of employment? Yes ____, No ____. Explain-_____

_____

_____.

n. Did the position of the sun in relation to your target influence the technique of employment? Yes ____, No ____. Explain-_____

_____

_____.

o. How did the enemy situation, capabilities, or limitations influence the technique of employment? Mark the factors which influenced the technique of employment. Strength of enemy force _____. Employment of enemy force _____. Number of enemy weapons employed _____. Type of enemy weapons employed _____. Number and type of enemy weapons _____. Explain-_____

_____

_____.

p. The subsystem was fired from what mode of operation? Number of times in: Stow _____ Flexible _____ Both _____.

q. When operated in the flexible mode how many degrees left and right of the helicopter centerline and at what ranges were targets engaged?

Number of Degrees (L & R of Centerline)	Range (Meters)
0.....	_____
15.....	_____
30.....	_____
45.....	_____
60.....	_____

____..... _____

____..... _____

r. Remarks_____

PART II

OPERATIONAL CAPABILITIES AND LIMITATIONS AND COMBAT EFFECTIVENESS

Objective: Evaluate the operational capabilities and limitations and combat effectiveness of the M-5 armament subsystem in support of the counterinsurgency effort in Vietnam.

1. Was the M-5 effective when employed in support of counter-insurgency operations? Yes _____, No _____.

a. What was the maximum effective range of the subsystem? _____ meters.

b. Did the maximum effective range permit effective employment of the subsystem? Yes _____, No _____. Explain-_____

_____

_____.

c. What was the maximum range the projectile traveled before impact? _____ meters.

d. Could effective fire be placed on area targets? Yes ____, No _____. If not, why _____

_____

_____.

e. Could effective fire be placed on point targets? Yes ____, No ____. If not, why _____

_____

_____.

f. Was the cartridge, 40mm, HE, M-384 effective against personnel? Yes ____, No ____, Unable to determine ____ Why- _____

_____.

g. Was the cartridge, 40mm, HE, M-384 effective against vehicles? Yes _____, No _____, Unable to determine _____ Why-_____ _____.

h. Was the cartridge, 40mm, HE, M-384 effective against material? Yes _____, No _____, Unable to determine _____ Why-_____ _____.

i. Was the fuze, M-533, effective when employed in all types of terrain? Yes _____, No _____, Explain-_____ _____ _____.

j. Was the cartridge, 40mm, HE, M-348 suitable for day and night operations? Yes _____, No _____. If not, why-_____ _____ _____.

k. Did the smoke/flash from the bursting projectile permit observation of impact in all types of terrain? Yes _____, No _____. If not, how did you adjust fire?-_____ _____.

l. How many insurgents were KIA? _____, unable to determine ___.

m. How many insurgents were WIA? _____, unable to determine ___.

n. Was insurgent material damaged or destroyed? Yes _____ Number and type _____. Unable to determine _____.

o. Remarks--If unable to determine answers to questions l, m, and n, above, explain why a body count and material damage assessment could not be made. _____

_____

_____

_____.

2. What were the operational capabilities of the M-5 armament subsystem?

a. Did the subsystem provide effective suppressive fire? Yes _____, No _____. If not, why-_____

_____

_____

b. Did the subsystem provide other types of fire? Yes _____, what kind-_____. No _____.

3. What were the operational limitations of the M-5 armament subsystem?

a. Was the total ammunition capacity adequate? Yes _____, No _____.

b. Was the rate of fire adequate? Yes _____, No _____.

c. Was the muzzle velocity adequate? Yes _____, No _____.

d. Did the maximum effective range limit the employment of the subsystem? Yes _____, No _____.

e. Was the ammunition a limiting factor in any way? Yes _____, No _____. If yes, explain-_____

_____

_____.

f. Was the fuze, M-533, a limiting factor in any way? Yes _____, No _____. If yes, explain-_____

_____

_____.

g. Was the sight a limiting factor in any way? Yes _____, No _____

If yes, explain-_____

_____

_____.

h. Was the turret a limiting factor in any way? Yes _____, No _____

If yes, explain-_____

_____

_____.

i. Was the M-75 grenade launcher a limiting factor in any way?

Yes _____, No _____. If yes, explain-_____

_____

_____

_____.

j. Remarks-_____

PART III

(Complete once weekly)

EQUIPMENT AND PERSONNEL REQUIREMENTS

Objective: Determine the number of subsystems required and the adequacy of the TOE of aviation units so equipped with the M-5 armament subsystem.

1. What is the optimum number of subsystems for the airmobile company?

a. How many subsystems are authorized for each airmobile company? _____ (Number).

b. was the authorized allowance excessive? ____, Too low? ____.

c. What is the optimum number of M-5 subsystems for an airmobile company? _____ (Number).

d. What was the best combination of weapons in the armed platoon?

Type weapon	Number of helicopters
M-5.....	____
M-3.....	____
M-6.....	____
XM-14.....	____

or combinations _____

_____.

e. Was one or more different subsystems mounted on the same helicopters with the M-5? Yes ____, No ____. If yes, number and type

_____.

2. Is the airmobile company adequately staffed to support the M-5 subsystem?

a. Does the current TOE authorize sufficient personnel to support the M-5 subsystem? Yes _____, No _____. If not, how many personnel are considered adequate? Number _____ MOS _____ Number _____ MOS _____ Number _____ MOS _____ Number _____ MOS _____.

3. Is the airmobile company adequately equipped to support the M-5 subsystem?

a. Does the current TOE authorize sufficient equipment to support the M-5 subsystem? Yes _____, No _____. If not, what additional equipment is needed? _____

_____

_____.

4. Remarks-_____

PART IV

LOGISTICAL SUPPORT

Objective: Determine the logistical support required for the M-5 Armament subsystem in a counterinsurgency environment.

1. What logistical support was required for the M-5 operation?

a. Was maintenance required on the subsystem before, during, or after mission? Yes _____, No _____. Explain-_____

_____

_____

_____.

b. Was replacement of parts to the subsystem required before, during operation, or after mission? Yes _____, No _____. What part or parts?

_____

Why?-_____

_____.

c. Were parts readily available? Yes _____, No _____.

d. If parts were not available, why not? _____

_____

_____.

e. Where did personnel go to draw parts? _____

_____.

f. Number of rounds initially loaded? _____.

g. On this mission, number of times subsystem was reloaded? ___.

h. Total rounds expended on this mission? _____.

i. What was the average ammunition expenditure per day? Number of rounds _____ per system per day.

j. Is this adequate for future operation? Yes ___, No ____

If not, what would be the required amount per system per day? _____ rounds.

k. List type of malfunction on this mission caused by ammunition or material failure-_____

_____

_____.

l. List type of malfunction on this mission caused by personnel errors-_____

_____

_____.

m. What was the malfunction rate of the subsystem on this mission?

_____ stoppages per _____ rounds fired.
(number) (number)

n. Remarks-_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____.

PART V

SUMMARY OF MISSION

Evaluator estimate of crew proficiency or status of training-_____

Check List Completed - DTG

Rank - Name of Evaluator

Signature of Evaluator

(U) ANNEX F

TABULATED DATA

This annex contains data extracted from evaluator checklists.

The following code numbers are assigned to specific missions for ease in presenting data in the annex:

Code Number	Mission Type
1	Visual reconnaissance
2	Support of airmobile assault
3	Support of eagle assault
4	Overhead cover for ground operations
5	Escort of unarmed helicopters
6	Convoy escort
7	Emergency reaction force
8	Overhead cover for downed aircraft
9	Extraction
10	Special strike of Viet Cong training area
11	Support of long range reconnaissance patrol

1. AMMUNITION EXPENDITURE FOR VARIOUS MISSIONS PERFORMED

Date	Unit	Number 40mm Rds Expended	Type of Mission
16 Jul 65	Co A 502d Avn Bn	52	1, 2, 4, 5
17 Jul 65	Co A 502d Avn Bn	150	1, 7, 8
17 Jul 65	Co A 502d Avn Bn	150	1
18 Jul 65	Co A 502d Avn Bn	304	1, 3
20 Jul 65	Co A 502d Avn Bn	150	5

Date	Unit	Number 40mm Rds Expended	Type of Mission
21 Jul 65	119th Airmobile Co	0	5
22 Jul 65	119th Airmobile Co	70	3
23 Jul 65	119th Airmobile Co	30	5
23 Jul 65	Co A 502d Avn Bn	79	1, 2, 3, 4, 5, 6, 7
24 Jul 65	119th Airmobile Co	0	9
27 Jul 65	119th Airmobile Co	150	5
28 Jul 65	119th Airmobile Co	150	5
28 Jul 65	Co A 502d Avn Bn	212	4
28 Jul 65	Co A 502d Avn Bn	184	1, 3, 4, 5
30 Jul 65	117th Airmobile Co	40	5
31 Jul 65	117th Airmobile Co	225	10
3 Aug 65	119th Airmobile Co	340	2
3 Aug 65	121st Airmobile Co	300	1, 2, 4, 5
6 Aug 65	121st Airmobile Co	158	4, 7
6 Aug 65	121st Airmobile Co	150	1, 2, 4, 5, 7
9 Aug 65	119th Airmobile Co	150	5
10 Aug 65	117th Airmobile Co	225	5
11 Aug 65	Co A 1st Avn Bn	0	5
12 Aug 65	117th Airmobile Co	0	5
13 Aug 65	117th Airmobile Co	0	5
14 Aug 65	117th Airmobile Co	0	11
15 Aug 65	Co A 1st Avn Bn	0	3
16 Aug 65	117th Airmobile Co	0	5

Date	Unit	Number 40mm Rds Expended	Type of Mission
17 Aug 65	Co A 1st Avn Bn	150	3
24 Aug 65	114th Airmobile Co	70	3
25 Aug 65	114th Airmobile Co	130	3
26 Aug 65	114th Airmobile Co	160	4
27 Aug 65	Co A 101st Avn Bn	300	1, 2, 4, 5
27 Aug 65	114th Airmobile Co	175	4
27 Aug 65	Co A 101st Avn Bn	355	1, 2, 4, 5
27 Aug 65	Co A 101st Avn Bn	300	1, 2, 4, 5
30 Aug 65	114th Airmobile Co	80	6
3 Sep 65	114th Airmobile Co	525	1, 2, 3, 4
6 Sep 65	114th Airmobile Co	225	5
6 Sep 65	Co A 101st Avn Bn	175	1, 2, 4, 6

2. OPERATION IN THE FLEXIBLE MODE

A sampling is presented of flex mode operation. The number of degrees of turret travel left and right from the aircraft centerline is shown for various ranges. The missions of these dates correspond to those shown in paragraph 1 above.

Date	Unit	Turret Travel (Degrees)	Range (Meters)	Type of Mission
28 Jul 65	Co A 502d Avn Bn	0	1400	4
		15	600	
		30	400	
		45	200	
		60	100	
31 Jul 65	117th Airmobile Co	0	1700 to 400	10
		15	500 to 400	
		30	500 to 300	
		45	400 to 300	
		60	400 to 300	

Date	Unit	Turret Travel (Degrees)	Range (Meters)	Type of Mission
3 Aug 65	119th Airmobile Co	0	1200	2
		15	800	
		30	500	
		45	300	
		60	300	
10 Aug 65	117th Airmobile Co	0	1700	5
		15	1000	
		30	800	
		45	600	
		60	400	
25 Aug 65	114th Airmobile Co	0	1200	3
		15	700	
		30	700	
		45	600	
27 Aug 65	Co A 101st Avn Bn	0	1000	1, 2, 4, 5
		15	800	
		30	700	
		45	600	
3 Sep 65	114th Airmobile Co	0	1000	1, 2, 3, 4
		15	600 to 400	
		30	600 to 300	
		45	600 to 300	
		60	600 to 300	
6 Sep 65	Co A 101st Avn Bn	0	1200	1, 2, 4, 6
		15	800	
		30	600	
		45	500	
		60	300	

3. AMMUNITION AND METALLIC LINK MALFUNCTIONS

Date	Number of Malfunction(s)	Description of Malfunction(s)
23 Jul 65	2	Long round
28 Jul 65	1	Metallic link separation in ammunition chute
3 Aug 65	1	Long round

Date	Number of Malfunctions(s)	Description of Malfunctions(s)
10 Aug 65	1	Long round
24 Aug 65	1	Loose warhead (ogive)
25 Aug 65	1	Long round
27 Aug 65	1	Metallic link separation in ammunition chute
27 Aug 65	2	Long round
6 Sep 65	1	Metallic link separation in ammunition chute
	Total 11	

4. SUBSYSTEM MALFUNCTIONS

Date	Number of Malfunction(s)	Description of Malfunction(s)
23 Jul 65	1	Failure to feed--cartridge positioner spring clogged with sand.
28 Jul 65	2	Improper adjustment of electrical limit switch actuator.
3 Aug 65	1	Failure to feed--7.62mm cartridge case jammed between ammunition and rear ammunition chute.
3 Aug 65	1	Failure to fire--dirt in receiver.
24 Aug 65	1	Failure to feed--7.62mm cartridge case jammed between ammunition and rear ammunition chute.
6 Sep 65	1	Failure to feed--7.62mm ammunition link jammed between ammunition and rear ammunition chute.
	Total 7	

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(C) ANNEX G

SUBSYSTEM DISTRIBUTION

This annex lists distribution of subsystems from 29 May 1965 to 13 September 1965.

Subsystem No.	Date	Unit to which Assigned	Unit location (RVN)
1*	20 Jul 65	120th Airmobile Co, 145th Avn Bn	Tan Son Nhut
2	29 May 65	197th Airmobile Co, 145th Avn Bn	Tan Son Nhut
3	4 Jun 65	119th Airmobile Co, 52 Avn Bn	Pleiku
4	14 Jun 65	197th Airmobile Co, 145th Avn Bn	Tan Son Nhut
5**	17 Jun 65	117th Airmobile Co, 52d Avn Bn	Qui Nhon
6	19 Jun 65	Co A, 502d Avn Bn, 13th Avn Bn	Vinh Long
7	23 Jun 65	121st Airmobile Co, 13th Avn Bn	Soc Trang
8	30 Jun 65	Co A, 101st Avn Bn, 13th Avn Bn	Soc Trang
9	5 Jul 65	7th Airlift Plt, 14th Avn Bn	Da Nang
10	10 Jul 65	Co A, 1st Avn Bn, 52d Avn Bn	Ban Me Thout
11	13 Jul 65	197th Airmobile Co, 145th Avn Bn	Tan Son Nhut
12	15 Jul 65	120th Airmobile Co, 145th Avn Bn	Tan Son Nhut
13	16 Jul 65	Co A, 502d Avn Bn, 13th Avn Bn	Vinh Long
14	18 Jul 65	119th Airmobile Co, 52d Avn Bn	Pleiku
15	21 Jul 65	Co A, 501st Avn Bn, 145th Avn Bn	Bien Hoa
16	23 Jul 65	121st Airmobile Co, 13th Avn Bn	Soc Trang
17	26 Jul 65	7th Airlift Plt, 14th Avn Bn	Da Nang
18	29 Jul 65	Co A, 82d Avn Bn, 145th Avn Bn	Vung Tau
19***	1 Aug 65	Co A, 1st Avn Bn, 52d Avn Bn	Ban Me Thout

Subsystem No.	Date	Unit to which Assigned	Unit location (RVN)
20	4 Aug 65	Co A, 101st Avn Bn, 13th Avn Bn	Soc Trang
21	14 Aug 65	173d Airborne Brigade	Bien Hoa
22	17 Aug 65	118th Airmobile Co, 145th Avn Bn	Bien Hoa
23	21 Aug 65	114th Airmobile Co, 13th Avn Bn	Vinh Long
24	31 Aug 65	Co A, 82d Avn Bn, 145th Avn Bn	Vung Tau
25	31 Aug 65	114th Airmobile Co, 13th Avn Bn	Vinh Long
26	7 Sep 65	118th Airmobile Co, 145th Avn Bn	Bien Hoa
27	13 Sep 65	Co A, 501st Avn Bn, 145th Avn Bn	Bien Hoa

* CONUS-installed subsystem used for training 21 May to 19 July 1965.

** Combat loss 2 September 1965.

*** Partial combat loss 10 September 1965.